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# SCIENCE

DECEMBER 4, 1953

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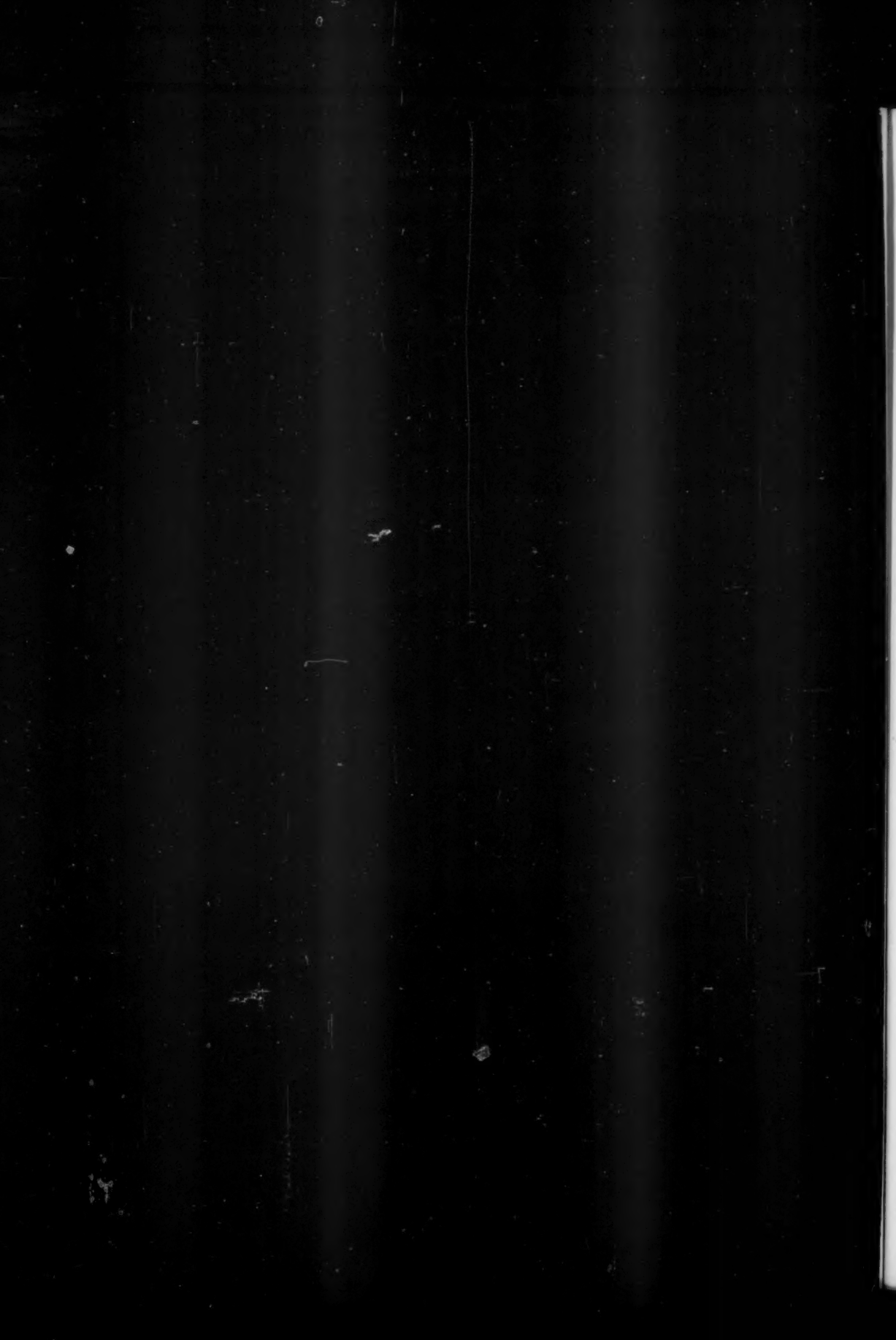
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Ruth C. Christman  
Acting Executive Editor

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(Terms expire June 30, 1954)

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## American Society of Agricultural Engineers

*Status changed from an Associated to an Affiliated Society, AAAS*

THE American Society of Agricultural Engineers, formerly an associated society of the AAAS, was recently elected an Affiliate. The Society was organized in a meeting at the University of Wisconsin in 1907 and was chartered as a nonprofit corporation under the laws of the State of Michigan in 1935. Through consistent growth it has become an organization with more than 4200 members, four technical divisions, a college division, and twenty-four geographical sections. It has more than 220 members in 45 countries other than the United States and Canada.

Objects of the Society, as stated in its constitution, are "to promote the science and art of engineering in agriculture; to encourage original research; to foster agricultural engineering education; to advance the standards of agricultural engineering; to promote the intercourse of agricultural engineers among themselves and with allied technologists; to encourage the professional improvement of its members; and severally and in cooperation with other groups to broaden the usefulness of agricultural engineering."

ASAE is represented in cooperative relations with several other technical and professional organizations. In addition the Society cooperates informally as occasion arises with state and federal agencies as well as with other engineering and scientific societies.

An annual meeting of the Society is held in June of each year, the place is fixed by the Council. A winter meeting each December, in Chicago, features sessions of the four technical divisions: Power and Machinery, Farm Structures, Rural Electric, and Soil and Water.

The Society's primary executive body is its Council. Current members are the president, E. W. Tanquary, engineer, International Harvester Company; past-president, I. D. Wood, engineer, Soil Conservation Service; past-president, Stanley Madill, executive engineer, Deere and Company; vice presidents, L. H. Skromme, chief engineer, New Holland Machine Division, Sperry Corporation; E. L. Hansen, partner, Hansen Brothers; and J. W. Martin, head, agricul-

tural engineering department, University of Idaho; and councilors, H. N. Stapleton, head, agricultural engineering department, University of Massachusetts; Howard Matson, chief, Region 4, Water Conservation Division, Soil Conservation Service; and Harry W. Dearing, Jr., agricultural engineer, Tennessee Coal and Iron Division, United States Steel Corporation.

Named to represent ASAE on the AAAS Council is G. A. Cumings, agricultural engineer with the U.S. Department of Agriculture, Beltsville, Maryland.

*Agricultural Engineering*, the monthly technical and professional journal of the Society, is its primary means of building up the literature of its field. It carries specially prepared original papers and research reports, as well as papers presented at meetings of the Society and its various sections. Standards, recommended practices, and other technical data are also published and a yearbook is in preparation.

Activities of the Society are shaped, in general, by the immediately pressing problems of agriculture; by opportunity to cooperate with agricultural scientists in work on physical factors influencing the productivity of crop plants and livestock and the control of pests; by occasion to implement the farm application of new knowledge produced by science; by continuing improvement in engineering materials, equipment, and methods; by the requirements of national defense; and by the outlook of its members on the continuing importance and long-range values of basic research.

Some of its currently active committees deal with extension methods, farm work simplification, farm safety, agricultural processing, professional registration, instrumentation and controls, hay harvesting and storage, fertilizer application, crop drying equipment, agricultural aviation, feed handling, heat lamps for brooding, animal shelter ventilation, erosion control, drainage, and irrigation.

**RALPH A. PALMER**  
Assistant Secretary

*American Society of Agricultural Engineers*  
Saint Joseph, Michigan

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The AAAS also publishes THE SCIENTIFIC MONTHLY. Subscription and advertising rates on request.

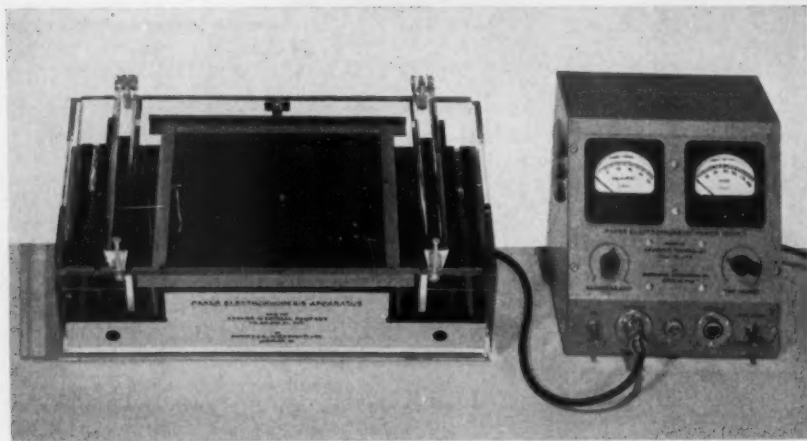
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# Preview of the 120th Meeting, AAAS, Boston

December 26-31, 1953

FROM advance registrations and Boston hotel reservation data, it is already evident that the 120th meeting of the American Association for the Advancement of Science will be both diversified and well attended—in the latter, quite possibly second only to the record-breaking New York meeting of 1949. Not only will all parts of the continent be represented, but a larger than usual number of distinguished foreign scientists will participate. A particularly fortunate occasion will be the address of A. V. Hill, recent past president of the British Association for the Advancement of Science, jointly sponsored by the AAAS and the Society of the Sigma Xi.

In the scope and quality of the programs, in the business to be transacted, and in the demonstrated concern for the state of science and of the nation, this seventh Boston meeting will be one of the most significant of the annual meetings of the AAAS, now in its 106th year of service to science, to scientists, and to society. No principal field of science will be unrepresented. There will be both short papers and specialized symposia in the major sciences and there will be the important interdisciplinary programs, so characteristic of AAAS meetings, which uniquely bring together scientists of diverse specialties. Fundamental matters in education and in society will also be considered. The theme of the 120th Meeting is "Scientific Resources for Freedom" and, appropriately, many of the symposia and one of the conferences will be devoted to the current status of scientific manpower, materials, and methods.

An inspection of the General Program-Directory, which is being sent advance registrants by first class mail at this time, shows that the 120th meeting of the Association will combine many traditional aspects and will also have several new features. Included are:

**1. Contributed Papers.** Among the 63 participating organizations, the national meetings of such societies as the American Meteorological Society, the American Society of Human Genetics, the American Society of Zoologists, the Genetics Society of America, and the Society of Systematic Zoology—and the regional meetings of such organizations as the American Geophysical Union, the American Industrial Hygiene Association, the Society for the Study of Evolution, and the Society of Exploration Geophysicists—ensure a considerable number of sessions for short reports of current research. In addition, 8 AAAS sections (C-Chemistry, E-Geology and Geography, G-Botanical Sciences, H-Anthropology, I-Psychology, L-History and Philosophy of Science, N-Pharmacy, and Q-Education) will have sessions for contributed papers.

**2. Symposia.** The 2 general symposia, "Species Which Feed Mankind" and "The Sea Frontier," some 41 sectional symposia, with a total of 65 sessions, and 12 societal symposia were outlined in *SCIENCE*, 118, 524. Two more in the societal category are "Science and the Public," sponsored by the National Association of Science Writers, and "Identification of the Dead," arranged by Richard Ford for the Academy of Forensic Sciences.

**3. Vice Presidential Addresses.** With four exceptions

(K, M, O, P) the remaining sections of the Association have arranged vice presidential addresses by current or recent vice presidents for their 12 sections.

**4. Conferences.** There are 3 recurrent conferences at annual meetings of the Association. The Academy Conference, now representing 42 academies of science affiliated with the AAAS, the Conference on Scientific Editorial Problems II, and the Conference on Scientific Manpower III will continue with their consideration of the problems of their respective areas.

**5. Special Sessions.** One of the characteristic and most important features of the annual meetings of the Association is the series of outstanding general addresses by distinguished authorities, sponsored by organizations that meet regularly with the AAAS. These special events are joint sessions with the Association and are open to the general public of the city in which the meeting is held.

**I. Sunday evening, Dec. 27, Ballroom, Hotel Statler; 8:00 p.m.** American Association for the Advancement of Science and the Society of the Sigma Xi.

Speaker: A. V. HILL, Foulerton Research Professor of the Royal Society, University College, London, London, England; past president, British Association for the Advancement of Science.

Subject: The Design and Mechanism of Muscles (Illustrated).

DETLEV W. BRONK, president, Rockefeller Institute for Medical Research, and chairman of the Board of Directors of the Association; and LEWIS J. STADLER, professor of field crops, University of Missouri, president of the Society, will serve as cochairmen.

**II. Sunday evening, Dec. 27, Grand Hall, Mechanics Building; 8:30 p.m.** National Geographic Society.

Speaker: LUIS MARDEN, member, Foreign Editorial Staff, National Geographic Society.

Subject: Sicily, the Forgotten Island (Illustrated).

MEREDITH F. BURRILL, vice president for AAAS Section E, will preside.

**III. Monday evening, Dec. 28, Ballroom, Hotel Statler; 8:00 p.m.** AAAS Presidential Address.

Speaker: DETLEV W. BRONK, president, Rockefeller Institute for Medical Research, and retiring president of the Association.

Subject: The Role of Scientists in the Furtherance of Science.

EDWARD U. CONDON, director of research, Corning Glass Works, and president of the Association, will preside.

Preceding the address, EARL P. STEVENSON, president, Arthur D. Little, Inc., and general chairman, seventh Boston meeting, will speak briefly.

Following the address there will be an informal AAAS Presidential Reception in the adjacent Ballroom Assembly. All registrants and members of local committees are cordially invited to attend.

**IV. Tuesday evening, Dec. 29, Ballroom, Hotel Statler; 8:00 p.m.** Scientific Research Society of America.

JOSEPH W. BARKER, Research Corporation, president of the Society will preside.

Speaker: DAVID B. STEINMAN, consulting engineer, New York, New York.



Subject: Suspension Bridges—The Aerodynamic Problem and Its Solution (Illustrated).

**V. Wednesday evening, Dec. 30, Georgian Room, Hotel Statler; 8:30 p.m.** United Chapters of Phi Beta Kappa.

Speaker: LEONARD CARMICHAEL, secretary, Smithsonian Institution.

Subject: Science and Social Conservatism.

KIRTLEY F. MATHER, professor of geology, Harvard University, will preside. WARREN WEAVER, president elect, will represent the Association.

**6. The Scientist in American Society.** Early in the year, a committee of Section K and the AAAS Symposium Committee, without knowledge of each other's plans, both decided that there should be a program on some of the social and political problems confronting American scientists at the present time. The following 2 sessions, combined by mutual consent, are sponsored by the Association as a whole:

**Sunday Afternoon, December 27**

**2:30 p.m.;** Talbot Hall, Mechanics Building; *Symposium: The Scientist in American Society, Part I: Freedom for Scientific Inquiry.* Arranged by a committee of Section K-Social and Economic Sciences, CONRAD TAEUBER, assistant director, Bureau of the Census, secretary.

DETLEV W. BRONK, *presiding*

1. The Beliefs and Expectations of the Public. CLYDE W. HART, HERBERT HYMAN, PAUL B. SHEATSLEY, and SHIRLEY A. STAR, National Opinion Research Center, Chicago, Ill.
2. The Social Psychology of Political Loyalty in Liberal and Totalitarian Societies. RAYMOND A. BAUER, lecturer on social psychology and research associate, Russian Research Center, Harvard University.

**Tuesday Evening, December 29**

**8:00 p.m.;** Paul Revere Hall, Mechanics Building; *Symposium: The Scientist in American Society, Part II.* Arranged by a subcommittee of the AAAS Symposium Committee: CHARLES D. CORVELL, professor of chemistry, Massachusetts Institute of Technology, chairman, P. M. MORSE, and V. F. WEISSKOPF, professors of physics, Massachusetts Institute of Technology, and BART J. BOK, associate director, Harvard Observatory.

EDWARD U. CONDON, *presiding*

1. The Need for and the Production of Scientists. HAROLD C. UREY, distinguished service professor of chemistry, University of Chicago.
2. Scientists and Other Citizens. GERARD PIEL, publisher, *The Scientific American*.
3. The Legal Basis for Intellectual Freedom. MARK DE WOLFE HOWE, professor of law, Harvard University.
4. Scientists and Political Action. EDWIN C. KEMBLE, professor of physics, Harvard University.
5. Discussion, led by EDWARD U. CONDON, director of research, Corning Glass Works.

**7. AAAS Business Sessions:**

The Board of Directors of the Association will meet for dinner and a business session in the administrative secretary's suite at the Hotel Statler at 8:00 p.m. on Saturday, Dec. 26. Dates and hours of subsequent sessions of the Board of Directors during the meeting will be decided at this first session.

The Council of the Association will meet Sunday after-

noon, Dec. 27, at 4:00 p.m. in Parlor A, Hotel Statler. A second session of the Council is scheduled for Wednesday morning, Dec. 30, at 9:00 a.m. in the same room. All members of the Council have been notified individually and it is hoped that all can attend.

Subjects to be considered by the Council (in addition to the agenda prepared) usually are first brought before the Board of Directors through the administrative secretary. During the meeting, communications for the Board of Directors should be submitted in writing and left at the Hotel Statler mail desk, addressed to Dr. Detlev W. Bronk.

**8. AAAS Science Theatre Programs:**

The AAAS Science Theatre, a permanent feature of the Association's annual meeting, presents showings of the latest domestic and foreign scientific films—nearly all with sound—throughout the meeting period. Please note, in the following schedule, that programs are both repeated and transposed to increase the opportunities for those attending the sessions of the 120th meeting to see particular films. Most titles, but not all, will be shown twice. The Association is greatly indebted to all those who made these pictures and lent them for showing.

The AAAS Science Theatre is on the second floor of the Mechanics Building, in a room which seats 225 comfortably. The Science Theatre is reached by passing through a portion of the exhibit area of the Annual Exposition of Science and Industry and ascending the first stairs on the left.

The Science Theatre is a feature for the pleasure and information of all registrants attending the annual meeting; it is deemed well worth the considerable cost of projection. It cannot be for the casual passerby; thus admission is restricted to those who wear the AAAS convention badge, or who show an Association registration receipt.

**Hours**

Sun., Dec. 27	9:00 A.M.—1:00 P.M.; 2:00 P.M.—6:00 P.M.
Mon., Dec. 28	9:00 A.M.—1:00 P.M.; 2:00 P.M.—6:00 P.M.
Tues., Dec. 29	9:00 A.M.—1:00 P.M.; 2:00 P.M.—6:00 P.M.
Wed., Dec. 30	8:00 A.M.—noon; noon—4:00 P.M.

**PROGRAM 1**

**Sunday Afternoon, Dec. 27, 2:00 p.m.—6:00 p.m.**

1. CHEMICAL BRUSH CONTROL. American Museum of Natural History. Color. Sound. 23 min.
2. DEMONSTRATIONS IN PERCEPTION. United States Navy. Black-and-white. Sound. 30 min.
3. DECISION FOR CHEMISTRY. Monsanto Chemical Company. Black-and-white. Sound. 35 min.
4. LOCOMOTION OF SNAKES. New York Zoological Society. Color. Sound. 11 min.
5. GENETICS AND BEHAVIOR. Joseph J. Antonitis and J. P. Scott. Color. Silent. 16 min.
6. RADIOISOTOPES: THEIR APPLICATIONS TO HUMANS. Medical Film Guild, Ltd. Color. Sound. 32 min.
7. THE CHAIN OF LIFE. Pictura Films Corporation. Color. Sound. 11 min.
8. PROMINENCE ACTIVITY. Sacramento Peak Station of Harvard College Observatory, Sunspot, N. M. Black-and-white. Silent. 15 min.
9. LIVES OF THEIR OWN. Pictura Films Corporation. Color. Sound. 11 min.
10. MAN TO MAN. Mental Health Film Board. Black-and-white. Sound. 30 min.
11. BETTER AND SAFER HIGHWAYS. The Firestone Tire and Rubber Company. Black-and-white. Sound. 7 min.



# PROGRAM 2

Monday Morning, Dec. 28, 9:00 a.m.-1:00 p.m.

1. WARNING SHADOW. National Cancer Institute and American Cancer Society. Color. Sound. 21 min.
2. LEONARDO DA VINCI. Pictura Films Corporation. Color. Sound. 68 min.
3. ANTARCTIC VIGIL. Australian News and Information Bureau. Color. Sound. 10 min.
4. SEE HOW THEY SWIM. Pictura Films Corporation. Color. Sound. 11 min.
5. TARGET NEVADA. Department of Defense. Color. Sound. 14 min.
6. WHICH FATE. National Society for Medical Research. Color. Sound. 28 min.
7. WATERS OF COWENTA. Forest Service, U.S.D.A. Color. Sound. 20 min.
8. WHITE SPLENDOR. Pictura Films Corporation. Color. Sound. 11 min.
9. HIGH QUALITY SPICULES AND CHROMOSPHERE. Sacramento Peak Station of Harvard College Observatory, Sunspot, N. M. Black-and-white. Silent. 15 min.
10. PROJECT TINKERTOY. National Bureau of Standards. Black-and-white. Sound. 27 min.

# PROGRAM 3

Monday Afternoon, Dec. 28, 2:00 p.m.-6:00 p.m.

1. THIS IS MAGNESIUM. Bureau of Mines. Black-and-white. Sound. 15 min.
2. AUTONOMIC NERVOUS SYSTEM, PARTS III AND IV. J. E. Markee and R. F. Becker, Duke University. Color. Sound. 42 min.
3. SEE HOW THEY FLY. Pictura Films Corporation. Color. Sound. 11 min.
4. OAK WILT. National Oak Wilt Research Committee. Color. Sound. 22 min.
5. VOICES UNDER THE SEA. British Information Services. Black-and-white. Sound. 19 min.
6. THE EFFECT OF ELECTRO-CONVULSIVE SHOCK ON "CONDITIONED ANXIETY." H. F. Hunt and J. V. Brady. Color. Silent. 14 min.
7. BIRTH OF AN OIL FIELD. Shell Oil Company. Color. Sound. 11 min.
8. KING OF THE RIVER. Pictura Films Corporation. Color. Sound. 11 min.
9. LIFE STORY OF A WATER MOLD. Arthur T. Brice-Phase Films. Black-and-white. Sound. 11 min.
10. "A" IS FOR ATOM. General Electric Company. Color. Sound. 16 min.
11. NEW FRONTIERS IN SPACE. McGraw-Hill Book Co., Text-Film Dept. Black-and-white. Sound. 25 min.

# PROGRAM 4

Tuesday Morning, Dec. 29, 9:00 a.m.-1:00 p.m.  
Same as Program 1.

# PROGRAM 5

Tuesday Afternoon, Dec. 29, 2:00 p.m.-6:00 p.m.  
Same as Program 2.

# PROGRAM 6

Wednesday Morning, Dec. 30, 8:00 a.m.-noon.  
Same as Program 3.

# PROGRAM 7

Wednesday Afternoon, Dec. 30, noon-4:00 p.m.

1. LIVING WATER SERIES, PART I: NATURE'S PLAN. Conservation Foundation. Color. Sound. 30 min.

2. RADIOISOTOPES, PART XII: AGRICULTURAL RESEARCH. Department of the Army. Black-and-white. Sound. 40 min.
3. THE SEA LAMPREY. Fish and Wildlife Service. Color. Sound. 13 min.
4. BATTLE OF THE BEETLES. Forest Service, U.S.D.A. Color. Sound. 16 min.
5. SAND AND FLAME. General Motors Corporation. Black-and-white. Sound. 20 min.
6. FLYING DOCTOR. Australian News and Information Bureau. Black-and-white. Sound. 11 min.
7. THE MECHANICAL INTEREST AND ABILITY OF A HOME-RAISED CHIMPANZEE. Keith J. Hayes and Catherine Hayes, Yerkes Laboratories of Primate Biology. Black-and-white. Silent. 60 min.
8. THE QUESTING MIND. General Motors Corporation. Color. Sound. 20 min.
9. WOODCOCK. Fish and Wildlife Service. Color. Sound. 14 min.

## BOSTON MEETING INFORMATION

### Hotel Headquarters

The Hotel Statler is the official headquarters of the AAAS; it is where the Council of the Association will meet and where other business sessions will be held. The Press Room, for receipt of authors' abstracts and the only source of press releases, is in Parlor D-E on the mezzanine floor, one flight above the lobby.

The Main Registration-Information Center, the Visible Directory of Registrants, the AAAS Office, the AAAS Science Theatre, and the Annual Exposition of Science and Industry are all in Mechanics Building, 111 Huntington Avenue, near Copley Square.

### Downtown Zone

Statler:  
(1300 rooms)  
Park Square

AAAS; Press; AAAS Sections C, F, I, Nm, Nd, and Np; Alpha Chi Sigma; American Society of Zoologists, Herpetologists League, Massachusetts Zoological Society, Society for the Study of Evolution, and Society of Systematic Zoology; Alpha Epsilon Delta, American Academy of Forensic Sciences, American Association of Hospital Consultants, American Institute of Nutrition, and American Psychiatric Association; International Association for Dental Research, North American Division; American Association of Colleges of Pharmacy, American College of Apothecaries, American Drug Manufacturers Association, American Pharmaceutical Association, American Pharmaceutical Manufacturers Association, and American Society of Hospital Pharmacists; American Book Publishers Council, American Textbook Publishers Institute, Conference on Scientific Editorial Problems, Honor Society of Phi Kappa Phi, National Association of Science Writers, Scientific Research Society of America, Society of the Sigma Xi, and United Chapters of Phi Beta Kappa.

Bradford:  
(400 rooms)  
275 Tremont St.

Academy Conferences; AAAS Cooperative Committee on the Teaching of Science and Mathematics; AAAS Section Q; National Speleological Society; American Nature Study Society, National Association of Biology

Teachers, National Science Teachers Association, and American Educational Research Association.

**Touraine:**  
(200 rooms)  
62 Boylston St.  
**Parker House:**  
(700 rooms)  
60 School St.

#### Copley Square Zone

**Sheraton Plaza:**  
(500 rooms)  
Copley Square  
AAAS Sections G, H, L, and O; American Eugenics Society, American Society of Human Genetics, American Society of Naturalists, Beta Beta Beta, Ecological Society of America, Genetics Society of America; American Society of Plant Physiologists, New England Section; History of Science Society, Institute for the Unity of Science, Philosophy of Science Association; American Academy of Arts and Sciences.

**Copley Square:**  
(124 rooms)  
47 Huntington Ave.  
**Lenox:**  
(175 rooms)  
61 Exeter St.  
**Vendome:**  
(300 rooms)  
160 Commonwealth Ave.

#### Back Bay Zone

**Somerset:**  
(500 rooms)  
400 Commonwealth Ave.  
AAAS Sections A, B, D, E, K, M, and P; American Meteorological Society and Sigma Pi Sigma; Association of American Geographers, Geological Society of America, National Geographic Society, and Society of Exploration Geophysicists; Committee for Social Physics, National Academy of Economics and Political Science, Pi Gamma Mu, and Society for the Advancement of Criminology; Engineering Manpower Commission; American Industrial Hygiene Association; American Geophysical Union, Committee of New England, Conference on Scientific Manpower, National Research Council, National Science Foundation, and Scientific Manpower Commission.

**Kenmore:**  
(400 rooms)  
490 Commonwealth Ave.

#### Registration

**Main Registration-Information Center.** The Main Registration-Information Center is located in the Mechanics Building, 111 Huntington Avenue, the entrance to which is the door nearest Copley Square. It will be open daily, Saturday, Dec. 26, through Thursday, Dec. 31, 8 A.M. to 6 P.M., except on Sunday, Dec. 27, when it is open until 9 P.M., and Tuesday evening, Dec. 29, when it will remain open till 11 P.M. to accommodate those nonregistrants who wish to attend the Biologists' Smoker.

Badges and General Programs may also be obtained at the supplementary registration desks, but the Main

Registration is the only place to receive a map of the city, guide books, and other complimentary literature. **Advance Registrants** (who have received programs and badges prior to the meeting) are urged to visit the Main Registration, at any convenient time, to receive these items.

**Supplementary Registration Desks.** For the convenience of those attending the 120th meeting, there are four supplementary registration desks as follows:

#### Hotel Statler

Dec. 26	Noon-9 P.M.
Dec. 27	9 A.M.-9 P.M.
Dec. 28	8 A.M.-8 P.M.
Dec. 29	8 A.M.-8 P.M.

#### Hotel Sheraton Plaza

Dec. 26	4 P.M.-9 P.M.
Dec. 27	9 A.M.-9 P.M.
Dec. 28	8 A.M.-8 P.M.
Dec. 29	8 A.M.-Noon

#### Hotel Bradford

Dec. 26	1 P.M.-9 P.M.
Dec. 27	9 A.M.-9 P.M.
Dec. 28	8 A.M.-8 P.M.

#### Hotel Somerset

Dec. 26	1 P.M.-9 P.M.
Dec. 27	9 A.M.-9 P.M.
Dec. 28	8 A.M.-8 P.M.

**Registration Fee.** Each person who registers has the satisfaction of knowing that he has paid his personal share of the expenses of the meeting, and, at the same time, with his convention badge and with his registration card posted in the Visible Directory, he has become a definite participant in the 120th meeting. As a registrant, he may visit the AAAS Science Theatre repeatedly and enjoy refreshments and tobacco at the Biologists' Smoker.

The AAAS registration fee for all persons is \$2.50. Each registrant receives a receipt, a convention badge, and the General Program-Directory, the only publication with the programs of all 18 AAAS Sections and of the 63 participating organizations. Any person who purchased an advance copy of the General Program-Directory but did not register in advance and who then attends the Meeting has agreed to complete his registration and is expected to do so, at the *Main Registration only*, after which he receives his convention badge and the privileges that go with it.

It is essential that each person who attends the Meeting support it by paying the registration fee of \$2.50, which, intentionally, has been kept at a minimum. When the costs of the program and badge are deducted, the net contribution toward general expenses is less than one dollar per registrant.

**AAAS Convention Badge.** The AAAS convention badge indicates that you have paid your share of the expenses of the Meeting and that you are a complete participant in this 120th convention of the Association. The badge should be worn throughout because: (1) it reminds others to register; (2) it is needed for admission to the AAAS Science Theatre, the Biologists' Smoker, and the reception that follows the presidential address; and (3) it helps your friends to find you.

**Visible Directory of Registrants.** The much-consulted Visible Directory of Registrants, for the maximum convenience of all, is located between the Main Registration and the Annual Exposition of Science and Industry. The hours it will be open correspond exactly with the hours that the Main Registration is open—daily, 8 A.M. to 6 P.M.,

except Sunday and Tuesday evenings, when it is open till 11 P.M. The registration cards of all registrants are placed in the Visible Directory as soon as possible after registration. The arrangement is alphabetical. The cards of advance registrants are *completely* alphabetized and typed as they were posted in Washington prior to the meeting; all other registration cards are filed to the second or third letter of the surname (Ba, Be, etc.). Members of the press, exhibitor personnel, and guests are included in the Visible Directory—on *blue* cards instead of yellow. Registrants will find the Visible Directory invaluable in determining the convention addresses of friends attending.

**Mail, Telegrams, and Messages.** Mail and telegrams addressed in care of the AAAS will be held at the AAAS Office in Mechanics Building. Every effort will be made to notify addressees listed in the Visible Directory but the Association assumes no responsibility for the delivery of mail or of telegrams.

Telephone and personal messages will be filed alphabetically in the AAAS Office and the names for whom they are intended will be posted on a bulletin board.

**Society Meal Function Tickets.** Tickets to the dinners or luncheons of any participating society are obtainable only from representatives of that society, usually during preceding sessions of that society. *A list of all meal functions will be printed in the General Program Directory.*

## Mechanics Building

The large red brick Mechanics Building, owned and operated by the Massachusetts Charitable Mechanic Association, is well known to New Englanders and to those who have met in Boston because it has long been the site of all large conventions and expositions. Located at 111 Huntington Avenue, two blocks west of Copley Square, it is also relatively close to the downtown hotels and those of Back Bay. **Only one entrance will be used, the one nearest Copley Square,** at the east end of the building. Immediately inside this entrance is the Main Registration-Information Center and, next, in order, the Visible Directory of Registrants and the Exposition. The session rooms and the Science Theatre on the second floor are reached by passing *halfway* through the exhibit area and ascending the stairs on the left. Session rooms on the basement level are reached by passing through the *entire* exhibit area and descending stairs on the left.

## Detailed Location of Rooms and Features in Mechanics Building

Feature	Location
AAAS Office	Main floor, just inside of entrance.
Biologists' Smoker	Main floor, Grand Hall.
Exposition	Main floor, through Visible Directory.
Luncheon Facilities	Main floor, through Exposition.
Main Registration-Information Center	Main floor, just inside entrance.
New Member Service	Main floor, booth in Exposition.
Science Theatre	Second floor, use stairs on left.
Visible Directory of Registrants	Main floor, past Main Registration.
Session Rooms	Location
Grand Hall	Main floor, through Exposition
Paul Revere Hall	Second floor
Talbot Hall	Second floor
Room A	Second floor
Room B	Second floor
Room C	Basement floor, under exhibits, southeast corner.

## Room D

Basement floor, under exhibits, northwest corner.

## Room E

Basement floor, under Grand Hall, south wall.

## Room F

Basement floor, under Grand Hall, north wall.

## Local Travel Directions

In general, taxis are recommended. Boston taxis are convenient and the fares are moderate in price, particularly when three or four persons who are together ride for one fare.

## Between the Copley Square Hotels and Mechanics Building:

Since the Sheraton Plaza, Copley Square, and Lenox hotels are but two or three blocks from the entrance at the east end of Mechanics Building, and the Vendome not much further, normally, no transportation of any sort is required.

## From the Downtown Hotels to Mechanics Building:

**Parker House**—Enter Park Street subway station (at corner of Boston Common, one block away); take *westbound* underground trolley marked **HEATH STREET, ARBORWAY, or HUNTINGTON AVENUE**; pass through stations, **BOYLSTON, ARLINGTON, COPLEY**; get off at **MECHANICS**.

**Bradford and Touraine**—Enter Boylston Street subway station (at intersection with Tremont St.); take same line to **MECHANICS**.

**Staller**—Enter Arlington Street subway station ( $\frac{1}{2}$  block north of hotel); take same line to **MECHANICS**.

## To Return to the Downtown Hotels:

Reverse the route described, via any *eastbound* car.

## From the Back Bay Hotels to Mechanics Building:

**Kenmore Hotel**—Enter Kenmore subway station and take any *eastbound* underground trolley through **MASSACHUSETTS and COPLEY to ARLINGTON**; transfer via stairway to *westbound* underground trolley marked **HEATH STREET, ARBORWAY, or HUNTINGTON AVENUE**; pass through **COPLEY to MECHANICS**.

**Somerset Hotel**—Same as for Kenmore Hotel but enter subway at **MASSACHUSETTS**.

## To Return to the Back Bay Hotels from Mechanics:

Take any *eastbound* car to **ARLINGTON** cross to *westbound* track by stairway, take any car marked **COMMONWEALTH AVENUE, LAKE STREET, or BOSTON COLLEGE**; get off at **MASSACHUSETTS** for **Somerset** or **KENMORE** for **Kenmore Hotel**.

## Points of Interest

At this meeting, there will be no formal tours sponsored by the AAAS as a whole, although certain sections and participating societies have planned various tours and a field trip. It is anticipated, however, that a number of those attending this seventh Boston meeting will wish to visit one or more of the museums, educational institutions, or other points of interest for which this metropolis, more than three centuries in age, is justly famous.

These landmarks and historic shrines are too numerous to describe here in detail. Several booklets will be distributed to all registrants at the Main Registration-Information Center in the Mechanics Building. Advance registrants should call for their copies. The principal points of interest include:

### Historic Landmarks

Boston Common	
Boston Massacre site	State and Congress Streets
Boston Tea Party site	Atlantic Avenue and Pearl Street
Bunker Hill Monument	Charlestown
Concord Bridge and Minute Man Statue	Concord
Faneuil Hall	Faneuil Hall Square
Frigate "Constitution"	Navy Yard, Charlestown
Granary Burying Ground and Park Street Church	Tremont and Park Streets
House of Seven Gables	Salem
Kings Chapel and Burying Ground	
	Tremont and School Streets
Longfellow House	105 Brattle Street, Cambridge
Lowell House	Elmwood Avenue, Cambridge
Old North Church	187 Salem Street
Old South Meeting House	
	Washington and Milk Streets
Old State House	Washington and State Streets
Paul Revere House	19 North Square
State House	Beacon Hill
Wayside Inn and Old Mill	Sudbury

### Museums, Gardens, and Libraries

American Academy of Arts and Sciences	
	28 Newbury Street
Arnold Arboretum	Jamaica Plain
Boston Public Library	Copley Square
Botanical Museum, Harvard (Ware Collection of Blaschka Glass Models)	Cambridge
Fogg Art Museum, Harvard	Cambridge
Franklin Park Zoo and Botanical Gardens	Dorchester
Gray Herbarium, Harvard	
	Garden and Linnaean Streets, Cambridge
Horticultural Hall, Massachusetts Horticultural Society	
	Huntington and Massachusetts Avenues
Isabella Stewart Gardner Museum	Fenway Court
Massachusetts Historical Society	
	Boylston Street and The Fenway
Massachusetts State Library	State House, Beacon Hill
Museum of Comparative Zoology, Harvard	Cambridge
Museum of Fine Arts	
	Huntington Avenue and The Fenway
Museum of Science (and Planetarium)	
	Science Park, near North Station
Peabody Museum of Archaeology and Ethnology,	
Harvard	Cambridge

### Educational Institutions

Boston College	Chestnut Hill, Newton
Boston University	Commonwealth Avenue
Harvard University	Cambridge
Harvard University Medical and Dental Schools	
	Longwood Avenue, off Huntington Avenue
Massachusetts College of Pharmacy	
	179 Longwood Avenue
Massachusetts Institute of Technology	Cambridge
New England Conservatory of Music	
	294 Huntington Avenue
Northeastern University	360 Huntington Avenue
Radcliffe College	Cambridge
Simmons College	300 The Fenway
Tufts College	Medford
Tufts College Medical and Dental School	
	136 Harrison Avenue
Wellesley College	Wellesley

### AAAS Public Information Service

Each person who will deliver an address or present a paper at the Boston meeting is requested to provide the Association's Public Information Service with 100 copies of a nontechnical abstract of his paper. One hundred copies of complete manuscripts are also required of

papers presented by: (1) officers of the Association; (2) officers and invited speakers who appear on the programs of the participating societies; and (3) authors whose papers are particularly newsworthy. Most authors already have recognized the necessity of this procedure and have sent their material to the Association's director of public information, Sidney S. Negus, Medical College of Virginia, Richmond. If you are an author of an address or a paper and have not done this, please send to Dr. Negus, to arrive in Richmond on or before Dec. 15th, 100 copies of your nontechnical abstract and 100 copies of your full paper (or significant portions of it, if it is unusually long). If it is impossible for you to send this material to Richmond to arrive by Dec. 15 (and mails are much slower in the pre-Christmas period), then mail all of your material to Dr. Negus at the Hotel Statler, Boston, or deliver it to him in person in the AAAS Press Room, Parlor D-E, mezzanine, Hotel Statler, before or during the convention. Please be sure, as an aid to the Association's Public Information Service, to send copies of your paper to your local newspapers with the time indicated when it is to be presented in Boston.

The necessity for the general public to be kept informed of the results of the scientific research which it supports, directly and indirectly, is quite evident. Organized science and the individual scientist must have the understanding and support of all. It is, of course, equally important that the advances of science be publicized with accuracy and clarity without sensationalism. Progress in this direction in recent years has been most gratifying thanks largely to members of the National Association of Science Writers, other accredited science reporters, managing editors of American newspapers, and program managers of radio and television stations.

It is in the interest of accuracy and completeness that science writers frequently wish to discuss various research results with investigators. If you are asked to cooperate in this respect or to participate in a press conference, please do so, not only for your own protection but for the benefit of science in general. Scores of science writers will be covering this meeting. News stories filed by the representatives of all the wire services will be published and broadcast throughout the entire civilized world. At no other scientific meeting are the facilities for the dissemination of the most recent findings in all branches of science so complete as they are at the great diversified meetings of the AAAS.

This year, not only is the Association fortunate in the continued services of Dr. Negus, chairman of the department of biochemistry, Medical College of Virginia, Richmond, and past president of the Virginia Academy of Science, but also in its local subcommittee on public information, headed by Wallace Dickson, director of public relations, The New England Council.

### The Boston Committees

As members of the Association realize, it would be quite impossible to arrange successfully a large and complex meeting and to carry it through to a conclusion, successful in all respects, if it were not for the substantial services of many local scientists and other members and friends of the Association. They merit the unstinted appreciation of all who attend. It is noteworthy that Earl P. Stevenson accepted the general chairmanship of the seventh Boston meeting in the fall of 1952, attended and studied the operations of the St. Louis meeting, appointed the local committees early in the year, and has kept in



close touch with all phases of this year's meeting. In making the 120th meeting a memorable one, those whose names follow have advanced science.

#### General Chairman

EARL P. STEVENSON, president, Arthur D. Little, Inc.

#### Vice Chairmen

WALTER S. BAIRD, president, Baird Associates, Inc.

CARLTON P. FULLER, vice president, Polaroid Corporation.

#### Executive Secretary

WARREN S. BERG, Arthur D. Little, Inc.

#### General Committee

CHARLES F. ADAMS, JR., president, Raytheon Manufacturing Co.

BANCROFT BEATLEY, president, Simmons College.

S. BRUCE BLACK, president, Liberty Mutual Insurance Co.

GODFREY L. CABOT, president, Godfrey L. Cabot, Inc.

ERWIN D. CANHAM, editor, *Christian Science Monitor*.

HAROLD C. CASE, president, Boston University.

DEAN A. CLARK, general director, Massachusetts General Hospital.

PAUL F. CLARK, president, John Hancock Mutual Life Insurance Co.

THOMAS G. DIGNAN, president, Boston Edison Co.

DAVID F. EDWARDS, chairman of the board, Saco-Lowell Shops.

CARL S. ELL, president, Northeastern University.

JOSEPH A. ERICKSON, president, Federal Reserve Bank of Boston.

HUGH S. FERGUSON, president, Dewey and Almy Chemical Co.

WILLIAM W. GARTH, JR., president, Photon, Inc.

JAMES R. KILLIAN, JR., president, Massachusetts Institute of Technology.

EDWIN H. LAND, president, American Academy of Arts and Sciences.

RALPH LOWELL, trustee, Lowell Institute.

JOSEPH R. N. MAXWELL, S.J., president, Boston College.

RICHARD S. MORSE, president, National Research Corp.

JOSEPH W. POWELL, JR., vice president, American Research and Development Corp.

HAROLD B. RICHMOND, chairman of the board, General Radio Co.

ABRAM SACHAR, president, Brandeis University.

JAMES S. SIMMONS, dean, Harvard University School of Public Health.

EDWARD H. SMITH, Woods Hole Oceanographic Institution.

CHARLES H. SOMMER, general manager, Monsanto Chemical Co.

ROBERT C. SPRAGUE, president, Associated Industries of Massachusetts.

FRANK L. TUCKER, treasurer, General Radio Company.

H. BRADFORD WASHBURN, JR., director, Boston Museum of Science.

WILLIAM WEBSTER, executive vice president, New England Power Co.

NILS Y. WESSEL, dean, Tufts College.

LAURENCE F. WHITTEMORE, president, The New England Council.

#### Exhibits Committee

WALTER S. BAIRD, president, Baird Associates, Inc., chairman.

ELKAN BLOUT, associate director of research, Polaroid Corporation.

DAVIS R. DEWEY, vice president, High Voltage Engineering Corp.

MALCOLM G. KISPERT, assistant to the president, Massachusetts Institute of Technology.

DUNCAN E. MACDONALD, chairman, Physics Department, Boston University.

HENRY C. MEADOW, assistant dean, Faculty of Medicine, Harvard University.

ARTHUR E. THIESSEN, vice president, General Radio Company.

#### Finance Committee

CARLTON P. FULLER, vice president, Polaroid Corporation, chairman.

THOMAS D. CABOT, executive vice president, Godfrey L. Cabot, Inc.

DAVID F. EDWARDS, chairman of the board, Saco-Lowell Shops.

FRANK L. TUCKER, treasurer, General Radio Company.

#### Public Relations Committee

WALLACE DICKSON, director of public relations, The New England Council, chairman.

RALPH W. BURHOE, executive officer, American Academy of Arts and Sciences.

ERWIN D. CANHAM, editor, *Christian Science Monitor*.

CAROLINE HARRISON, director of public relations, Boston Museum of Science.

DONALD D. HATHAWAY, Baird Associates, Inc.

DONALD MCCAMMOND, director of public relations, Merrimac Division, Monsanto Chemical Co.

JOHN J. ROWLANDS, news director, Massachusetts Institute of Technology.

#### Service Committee

CARL M. F. PETERSON, superintendent of buildings and power, Massachusetts Institute of Technology, chairman.

DAWSON BLAMIRE, superintendent of buildings and grounds, Harvard Business School.

CLARENCE S. CASSIDY, bursar, Tufts Medical and Dental School.

FRANK H. CONANT, manager, Photo Service, Massachusetts Institute of Technology.

MILES P. COWEN, assistant to superintendent of buildings and power, Massachusetts Institute of Technology.

JAN P. FRIEZ, superintendent of buildings and grounds, Tufts College.

RALPH B. GATES, superintendent of buildings and grounds, Radcliffe College.

WILFORD P. HOOPER, superintendent of buildings and grounds, Harvard Medical School.

JOHN H. KREINHEDER, superintendent of buildings and grounds, Wellesley College.

LEONARD W. TAYLOR, superintendent of buildings and grounds, Boston University.

#### SUMMARY OF EVENTS

The AAAS Annual Exposition of Science and Industry and the AAAS Science Theatre, both in the Mechanics Building, open Sunday afternoon and close Wednesday afternoon. The Visible Directory of Registrants, also in the Mechanics Building, is open daily throughout the

meeting period from 8:00 A.M. to 6:00 P.M., except Sunday and Tuesday when it will remain open until 11:00 P.M.

#### Saturday, December 26

##### Saturday Morning

###### Education

**X5 American Nature Study Society**—10:00 A.M.; Meeting of Board of Directors; Conference Room, Bradford.

##### Saturday Afternoon

###### Astronomy

**D, B Section on Astronomy**; and **Section on Physics**—2:15 P.M.; Symposium: Radio Astronomy, Part I; General Survey; Lecture Hall, American Academy of Arts and Sciences.

###### Geology and Geography

**E4 National Speleological Society**—2:00 P.M.; General Session; Oval Room, Bradford.

###### Anthropology

**H Section on Anthropology**—2:00 P.M.; Symposium: Theoretical Models for the Study of Culture Change; State Suite, Sheraton Plaza.

###### Education

**X5 American Nature Study Society**—2:00 P.M.; Panel: New Techniques in Nature Photography; Governor Bradford Room, Bradford.

##### Saturday Evening

###### AAAS as a Whole

**AAAS Board of Directors Meeting**—8:00 P.M.; Suite of Administrative Secretary, Statler.

###### Astronomy

**D, B Section on Astronomy**; and **Section on Physics**—8:15 P.M.; Symposium: Radio Astronomy, Part II: Radio Sources; Lecture Hall, American Academy of Arts and Sciences.

###### Anthropology

**H Section on Anthropology**—8:00 P.M.; Symposium: The Indians of New England: Their Archaeology and Ethnology; State Suite, Sheraton Plaza.

###### Education

**X5 American Nature Study Society**—8:00 P.M.; Annual Meeting of the ANSS; Lobby Salon, Bradford. 8:30 P.M.; Annual Showing of Kodachromes; Lobby Salon, Bradford.

#### Sunday, December 27

##### Sunday Morning

###### AAAS as a Whole

**AAAS General Symposium**—9:30 A.M.; Species Which Feed Mankind, Part I: Plant Species; Paul Revere Hall, Mechanics Building.

**X3, X6, M American Book Publishers Council**; **American Textbook Publishers Institute**; and **Section on Engineering**—10:00 A.M.; Symposium: Transmission of Ideas, Part I; Room A, Mechanics Building.

###### Zoological Sciences

**F4 Society of Systematic Zoology**—10:00 A.M.; Council Meeting I; Room of Secretary, Statler.

###### Anthropology

**H, I Section on Anthropology**; and **Section on Psychology**—9:30 A.M.; Symposium: Non-human Primates and the Problems of Human Evolution, Part I; Ballroom Foyer, Sheraton Plaza.

###### History and Philosophy of Science

**L1 History of Science Society**—10:00 A.M.; Papers on the History of Physics and Chemistry; Back Bay Room, Sheraton Plaza.

###### Education

**FG7 National Association of Biology Teachers**—9:30 A.M.; Outstanding Techniques and Programs in Conservation Education; Oval Room, Bradford.

**X5 American Nature Study Society**—10:00 A.M.; Session; Governor Bradford Room, Bradford.

##### Sunday Afternoon

###### AAAS as a Whole

**AAAS General Symposium**—2:00 P.M.; Species Which Feed Mankind, Part II: Animal Species; Paul Revere Hall, Mechanics Building.

**K AAAS Section on Social and Economic Sciences**; and **AAAS Symposium Committee**—2:30 P.M.; The Scientist in American Society, Part I; Talbot Hall, Mechanics Building.

**X3, X6, M American Book Publishers Council**; **American Textbook Publishers Institute**; and **Section on Engineering**—2:00 P.M.; Symposium: Transmission of Ideas, Part II; Room A, Mechanics Building.

**AAAS Council Meeting I**—4:00 P.M. Parlor A, Statler.

###### Chemistry

**C Section on Chemistry**—2:00 P.M.; Contributed Papers; Room C, Mechanics Building.

###### Astronomy

**D Section on Astronomy**—2:30 P.M.; Vice Presidential Address; Lecture Hall, American Academy of Arts and Sciences.

**D, B Section on Astronomy**; and **Section on Physics**—3:30 P.M.; Symposium: Radio Astronomy, Part III: A Selection of Current Research Projects at Home and Abroad; Lecture Hall, American Academy of Arts and Sciences.

###### Zoological Sciences

**F4 Society of Systematic Zoology**—2:00 P.M.; Symposium: The Phoronidea, Bryozoa and Entoprocta, and Brachiopoda: Their Status as Phyla and Their Relationships; Ballroom Assembly, Statler.

###### Anthropology

**H, I Section on Anthropology**; and **Section on Psychology**—2:00 P.M.; Symposium: Non-human Primates and the Problems of Human Evolution, Part II; Ballroom Foyer, Sheraton Plaza.

###### Social and Economic Sciences

**K, E Section on Social and Economic Sciences**; and **Section on Geology and Geography**—2:30 P.M.; Symposium: Regional Analysis; Room D, Mechanics Building.

###### History and Philosophy of Science

**L, L3, L2, X13, X2 Section on History and Philosophy of Science**; **Philosophy of Science Association**; **Institute for the Unity of Science**; **National Science Foundation**; and **American Academy of Arts and Sciences**—2:00 P.M.; Symposium: Validation of Scientific Theories; Hub Room, Sheraton Plaza.

**L3 Philosophy of Science Association**—4:30 P.M.; Business Meeting; Hub Room, Sheraton Plaza.

###### Education

**Q1, Q AAAS Cooperative Committee on the Teaching of Science and Mathematics**; and **Section on Education**—1:30 P.M.; Symposium: The Next Generation of Young Scientists and Their Teachers; Lobby Salon, Bradford.

**X5 American Nature Study Society**—2:00 P.M.; Reaching the Larger Public with Nature Study; Governor Bradford Room, Bradford.



## Sunday Evening

### AAAS as a Whole

**AAAS, X17** *American Association for the Advancement of Science*; and *Society of the Sigma Xi*—8:00 P.M.; **Invited Address by A. V. Hill, British Association for the Advancement of Science**; Ballroom, Statler.

**E3** *National Geographic Society*—8:30 P.M.; Annual Illustrated Lecture; Grand Hall, Mechanics Building.

**X8** *Conference on Scientific Editorial Problems II*—8:00 P.M.; Conference on Scientific Editorial Problems; Room A, Mechanics Building.

### Zoological Sciences

**F4, FG8** *Society of Systematic Zoology*; and *Society for the Study of Evolution*—8:00 P.M.; Open House and Smoker; Director's Room, Museum of Comparative Zoology, Harvard.

### Biological Sciences

**FG2** *American Society of Human Genetics*—8:00 P.M.; Board of Directors Meeting; Copley Room, Sheraton Plaza.

### Anthropology

**H** *Section on Anthropology*—6:00 P.M.; Anthropologists' Dinner and Vice Presidential Address; Hub Room, Sheraton Plaza.

### History and Philosophy of Science

**L1** *History of Science Society*—8:00 P.M.; Council Meeting; Room 131, Sheraton Plaza.

### Education

**FG7, Q3, X5** *National Association of Biology Teachers*; *National Science Teachers Association*; and *American Nature Study Society*—6:00 P.M.; Banquet of the Science Teaching Societies; Lobby Salon, Bradford. 9:30 P.M.; All Societies Mixer; Lobby Salon, Bradford.

**X5** *American Nature Study Society*—8:00 P.M.; Presidential Program: Bering Sea Adventure (new film); Governor Bradford Room, Bradford.

## Monday, December 28

### Monday Morning

#### AAAS as a Whole

**X1** *Academy Conference*—9:00 A.M.; Business Meeting; Parlor A, Bradford. 10:15 A.M.; Round Table Discussion; Parlor A, Bradford.

**X9, M, M1, X15, X12, X13** *Conference on Scientific Manpower III*; *Section on Engineering*; *Engineering Manpower Commission*; *Scientific Manpower Commission*; *National Research Council*; and *National Science Foundation*—9:00 A.M.; Conference on Scientific Manpower: Part I: The Present Situation Respecting Scientific and Engineering Manpower; Louis XIV Ballroom, Somerset.

### Physics

**B, B1, X4** *Section on Physics*; *American Meteorological Society*, and *American Geophysical Union*—9:30 A.M.; Symposium: Physics of the Upper Atmosphere, Part I; Room A, Mechanics Building.

### Chemistry

**C, N, N10** *Section on Chemistry*; *Section on Medical Sciences*; and *American Institute of Nutrition*—9:30 A.M.; Symposium: Comparative Nutrition Requirements of Animal Species, Part I; Paul Revere Hall, Mechanics Building.

### Geology and Geography

**E, E2** *Section on Geology and Geography*; and *Geological Society of America*—9:30 A.M.; Symposium: New England Geology, Part I; Room D, Mechanics Building.

### Zoological Sciences

**F1** *American Society of Zoologists*—9:00 A.M.; Concurrent Session 1; Physiology of Development; Parlor B, Statler. 9:00 A.M.; Concurrent Session 2; Experimental Biology; Parlor A, Statler. 9:00 A.M.; Concurrent Session 3; Endocrinology; Parlor C, Statler.

**F4** *Society of Systematic Zoology*—10:00 A.M.; Annual Business Meeting; Parlor F, Statler.

### Biological Sciences

**FG2** *American Society of Human Genetics*—9:00 A.M.; Contributed Papers; Oval Room, Sheraton Plaza.

**FG4** *Beta Beta Beta*—9:00 A.M.; Executive session; Room 131, Sheraton Plaza.

**FG6** *Genetics Society of America*—9:00 A.M.; Concurrent Session 1; Short Papers; Ballroom Foyer, Sheraton Plaza. 9:00 A.M.; Concurrent Session 2; Short Papers; Hub Room, Sheraton Plaza.

### Botanical Sciences

**G** *Section on Botanical Sciences*—9:30 A.M.; Contributed Papers in General Botany; Back Bay Room, Sheraton Plaza.

**G, G1** *Section on Botanical Sciences*, and *New England Section of American Society of Plant Physiologists*—9:00 A.M.; Contributed Papers in Plant Physiology; Room 130, Sheraton Plaza.

**G, FG5** *Section on Botanical Sciences*, and *Ecological Society of America*—9:00 A.M.; Second National Pollen Conference, Session I; Copley Room, Sheraton Plaza.

### Anthropology

**H** *Section on Anthropology*—10:00 A.M.; Contributed Papers; State Suite, Sheraton Plaza.

### Social and Economic Sciences

**K, X14, X7, E** *Section on Social and Economic Sciences*; *New England Council*; *Committee of New England of the National Planning Association*; and *Section on Geology and Geography*—9:30 A.M.; Symposium: The Economic State of New England, Part I; Princess Ballroom, Somerset.

### History and Philosophy of Science

**L, L1** *Section on History and Philosophy of Science and History of Science Society*—9:30 A.M.; Symposium: Science and Its History: Three Currents of Interpretation; Jacob Sleeper Hall, Boston University Junior College.

### Engineering

**M, N, I** *Section on Engineering*; *Section on Medical Sciences*; and *Section on Psychology*—9:30 A.M.; Symposium: Communication Aids for the Blind; Room E, Mechanics Building.

### Medical Sciences

**Nm** *Subsection on Medicine*—9:30 A.M.; Symposium: Antimetabolites and Cancer, Part I; Talbot Hall, Mechanics Building.

**Np, N11, N14, N6, N8, N9, N12** *Subsection on Pharmacy*; *American Pharmaceutical Association*, *Scientific Section*; *American Society of Hospital Pharmacists*; *American Association of Colleges of Pharmacy*; *American College of Apothecaries*; *American Drug Manufacturers Association*; and *American Pharmaceutical Manufacturers Association*—9:00 A.M.; Greetings and Messages, Contributed Papers; Room C, Mechanics Building.

### Agriculture

**O** *Section on Agriculture*—9:00 A.M.; Symposium: Agronomic Problems of the Northeastern States, Part I; Room F, Mechanics Building.

### Education

**Q** *Section on Education*—9:00 A.M.; Concurrent

Session 1; Contributed Papers; Oak Room, Bradford. 9:00 A.M.; Concurrent Session 2; Contributed Papers; Glass Room, Bradford.

**FG7** *National Association of Biology Teachers*—8:00 A.M.; Meeting of Executive Board; Drawing Room, Bradford.

**FG7, Q3, X5, Q1** *National Association of Biology Teachers; National Science Teachers Association; American Nature Study Society; and AAAS Cooperative Committee*—8:30 A.M.; Science Teaching Films; Lobby Salon, Bradford. 9:30 A.M.; New Developments from Research into Resources of the Land; Lobby Salon, Bradford.

#### Monday Noon and Afternoon

##### AAAS as a Whole

**X1** *Academy Conference*—1:30 P.M.; Panel Presentation and Round Table Discussion of Three Topics; Parlor A, Bradford.

**X9, M, M1, X15, X12, X13** *Conference on Scientific Manpower III; Section on Engineering; Engineering Manpower Commission; Scientific Manpower Commission; National Research Council; and National Science Foundation*—2:00 P.M.; Conference on Scientific Manpower: Part II: The Present Situation Respecting Scientific and Engineering Manpower; Louis XIV Ballroom, Somerset.

##### Mathematics

**A** *Section on Mathematics*—4:30 P.M.; Vice Presidential Address; Room A, Mechanics Building.

##### Physics

**B, B1, X4** *Section on Physics; American Meteorological Society; and American Geophysical Union*—2:00 P.M.; Section B Vice Presidential Address and Symposium: Physics of the Upper Atmosphere, Part II; Room A, Mechanics Building.

##### Chemistry

**C, N, N10** *Section of Chemistry; Section on Medical Sciences; and American Institute of Nutrition*—2:00 P.M.; Symposium: Comparative Nutrition Requirements of Animal Species, Part II; Paul Revere Hall, Mechanics Building.

##### Geology and Geography

**E, E2** *Section on Geology and Geography; and Geological Society of America*—2:00 P.M.; Symposium: New England Geology, Part II; Room D, Mechanics Building.

##### Zoological Sciences

**F1** *American Society of Zoologists*—2:00 P.M.; Concurrent Session 1; General Physiology; Parlor A, Statler. 2:00 P.M.; Concurrent Session 2; Experimental Biology; Parlor B, Statler. 2:00 P.M.; Concurrent Session 3; Endocrinology; Parlor C, Statler. 4:45 P.M.; Business Meeting; Georgian Room, Statler.

**F2** *Herpetologists League*—2:00 P.M.; Conference on Common Names of the ASIH Checklist; Parlor F, Statler.

**F3** *Massachusetts Zoological Society*—4:30 P.M.; Progress Meeting and Arctic Lecture; Parlor F, Statler.

**F4** *Society of Systematic Zoology*—2:00 P.M.; Discussion Panel: Nomenclature: Results of the Sessions at the Copenhagen Congress; Ballroom Assembly, Statler.

##### Biological Sciences

**FG2** *American Society of Human Genetics*—2:00 P.M.; Symposium: Human Genetics and Medical Education; Oval Room, Sheraton Plaza. 4:00 P.M.; Annual Business Meeting; Oval Room, Sheraton Plaza.

**FG3, FG6** *American Society of Naturalists; and Genetics Society of America*—2:00 P.M.; Symposium: Some Biological Effects of Radiation from Nuclear Detonations; Ballroom, Sheraton Plaza.

**FG3** *American Society of Naturalists*—5:00 P.M.;

Annual Business Meeting; Ballroom Foyer, Sheraton Plaza.

**FG6** *Genetics Society of America*—2:00 P.M.; Short Papers; Hub Room, Sheraton Plaza.

##### Botanical Sciences

**G, G1** *Section on Botanical Sciences; and New England Section of American Society of Plant Physiologists*—2:00 P.M.; Contributed Papers in Plant Physiology; Ballroom Foyer, Sheraton Plaza.

**G, FG5** *Section on Botanical Sciences; and Ecological Society of America*—2:00 P.M.; Second National Pollen Conference, Session 2; Copley Room, Sheraton Plaza.

##### Anthropology

**H** *Section on Anthropology*—2:00 P.M.; Contributed Papers; State Suite, Sheraton Plaza.

##### Psychology

**I** *Section on Psychology*—2:00 P.M.; General Papers; Room E, Mechanics Building.

##### Social and Economic Sciences

**K, X14, X7, E** *Section on Social and Economic Sciences; New England Council; Committee of New England of the National Planning Association; and Section on Geology and Geography*—2:00 P.M.; Symposium: The Economic State of New England, Part II; Princess Ballroom, Somerset.

##### History and Philosophy of Science

**L1** *History of Science Society*—2:00 P.M.; New Methods in the Sciences; Back Bay Room, Sheraton Plaza.

##### Medical Sciences

**Nm** *Subsection on Medicine*—2:00 P.M.; Symposium: Antimetabolites and Cancer, Part II; Talbot Hall Mechanics Building.

**Np, N11, N14, N6, N8, N9, N12** *Subsection on Pharmacy; American Pharmaceutical Association, Scientific Section; American Society of Hospital Pharmacists; American Association of Colleges of Pharmacy; American College of Apothecaries; American Drug Manufacturers Association; and American Pharmaceutical Manufacturers Association*—2:00 P.M.; Contributed Papers; Room C, Mechanics Building.

##### Agriculture

**O** *Section on Agriculture*—2:00 P.M.; Symposium: Agronomic Problems of the Northeastern States, Part II; Room F, Mechanics Building.

##### Education

**Q** *Section on Education*—2:00 P.M.; Symposium: The Prediction of Child Development and Its Educational Implications; Glass Room, Bradford.

**FG7** *National Association of Biology Teachers*—12:30 P.M.; Annual Luncheon and Address; Reception Room, Bradford. 2:00 P.M.; Human Conservation; Reception Room, Bradford.

**Q3** *National Science Teachers Association*—2:00 P.M.; Concurrent Session 1; Elementary Program; Roof Ballroom, Bradford. 2:00 P.M.; Concurrent Session 2; Secondary Program; Lobby Salon, Bradford.

**X5** *American Nature Study Society*—2:00 P.M.; Panel: An Approach to Nature Education for Everyone; Governor Bradford Room, Bradford.

#### Monday Evening

##### AAAS as a Whole

**AAAS** *Presidential Address*—8:00 P.M.; Ballroom, Statler.

**AAAS** *Reception*—9:00 P.M.; Ballroom Assembly, Statler.

**X1 Academy Conference**—6:00 P.M.; Annual Dinner; Oak Room, Bradford.

#### Physics

**B, B2 Section on Physics**; and **Sigma Pi Sigma**—6:00 P.M.; Physicists' Dinner; Parlor B, Statler.

#### Botanical Sciences

**G Section on Botanical Sciences**—6:30 P.M.; All-Botanists' Dinner; Hub Room, Sheraton Plaza. 8:00 P.M.; Vice Presidential Address; Hub Room, Sheraton Plaza.

#### Social and Economic Sciences

**K, X14, X7, E Section on Social and Economic Sciences**; *New England Council*; *Committee on New England of the National Planning Association*; and *Section on Geology and Geography*—7:00 P.M.; Evening Banquet Session and Symposium: The Economic State of New England, Part III; Harvard Club.

#### History and Philosophy of Science

**L1 History of Science Society**—8:00 P.M.; Annual Dinner of the Society and Address; Club of Odd Volumes.

#### Education

**FG7 National Association of Biology Teachers**—8:00 P.M.; Meeting of Executive Board; Drawing Room, Bradford. 8:00 P.M.; Meeting of Health Committee; Room 520, Bradford.

#### Science in General

**X11 National Association of Science Writers**—8:30 P.M.; Symposium: Science and the Public; Schell Room, Sloan Building, Massachusetts Institute of Technology.

### Tuesday, December 29 Tuesday Morning

#### AAAS as a Whole

**AAAS General Symposium**—9:30 A.M.; The Sea Frontier, Part I; Paul Revere Hall, Mechanics Building.

**X9, M, M1, X15, X12, X13 Conference on Scientific Manpower III**; *Section on Engineering*; *Engineering Manpower Commission*; *Scientific Manpower Commission*; *National Research Council*; and *National Science Foundation*—9:00 A.M.; Conference on Scientific Manpower, Part III: The Utilization of Specialized Manpower Abroad; Country Room, Somerset.

#### Physics

**B, FG3 Section on Physics**; and *American Society of Naturalists*—9:30 A.M.; Symposium: Physics in Biology, Part I; Room E, Mechanics Building.

**B1 American Meteorological Society**—9:30 A.M.; Cloud Physics, Part I; Crystal Ballroom, Kenmore.

#### Chemistry

**C Section on Chemistry**—9:00 A.M.; Symposium: Chemicals in Food; Room C, Mechanics Building.

#### Geology and Geography

**E, M, P, E2, E1, X4 Section on Geology and Geography**; *Section on Engineering*; *Section on Industrial Science*; *Geological Society of America*; *New England Division, Association of American Geographers*; and *American Geophysical Union*—9:30 A.M.; Symposium: Water for Industry, Part I; Jacob Sleeper Hall, Boston University Junior College.

**E5 Society of Exploration Geophysicists**—9:00 A.M.; Technical Session; Balinese Room, Somerset.

#### Zoological Sciences

**F1 American Society of Zoologists**—9:00 A.M.; Concurrent Session 1; Embryology; Parlor A, Statler. 9:00 A.M.; Concurrent Session 3; Comparative Physiology; Parlor C, Statler.

**F1, FG5 American Society of Zoologists**; and *Ecological Society of America*—9:00 A.M.; Animal Behavior and Sociobiology; Parlor B, Statler.

**F4 Society of Systematic Zoology**—10:00 A.M.; Contributed Papers; Parlor F, Statler.

#### Biological Sciences

**FG2 American Society of Human Genetics**—9:00 A.M.; Contributed Papers; Oval Room, Sheraton Plaza.

**FG6 Genetics Society of America**—9:30 A.M.; Invitation Program; Main Lecture Room, Biological Laboratories, Harvard.

#### Botanical Sciences

**G, G1 Section on Botanical Sciences**; and *New England Section of American Society of Plant Physiologists*—9:30 A.M.; Symposium: The Uses of Large Scale Algal Cultures, Part I; Hub Room, Sheraton Plaza.

**G, FG5 Section on Botanical Sciences**; and *Ecological Society of America*—9:00 A.M.; Second National Pollen Conference, Session 3; Copley Room, Sheraton Plaza.

#### Psychology

**I Section on Psychology**—9:30 A.M.; Invited Papers: Experimental Approaches to the Study of Brain Function; Room A, Mechanics Building.

#### Social and Economic Sciences

**K Section on Social and Economic Sciences**—9:30 A.M.; The Individual Scientist in Today's World; Room B, Mechanics Building.

#### History and Philosophy of Science

**L, L3 Section on History and Philosophy of Science**; and *Philosophy of Science Association*—9:00 A.M.; Contributed Papers; State Suite, Sheraton Plaza.

**L Section on History and Philosophy of Science**—11:00 A.M.; Vice Presidential Address; State Suite, Sheraton Plaza.

#### Medical Sciences

**Nm Subsection on Medicine**—9:30 A.M.; Symposium: Antimetabolites and Cancer, Part III; Talbot Hall, Mechanics Building.

**Nd, N15 Subsection on Dentistry**; and *International Association for Dental Research, North American Division*—8:30 A.M.; Symposium: Recent Animal Experimentations in Caries Research; Lecture Hall, Harvard School of Dental Medicine.

**Np, N11, N14, N6, N8, N9, N12 Subsection on Pharmacy**; *American Pharmaceutical Association, Scientific Section*; *American Society of Hospital Pharmacists*; *American Association of Colleges of Pharmacy*; *American College of Apothecaries*; *American Drug Manufacturers Association*; and *American Pharmaceutical Manufacturers Association*—9:00 A.M.; Contributed Papers; Room D, Mechanics Building. 10:00 A.M.; Symposium: Professional Resources in Pharmacy in the United States; Room D, Mechanics Building.

#### Agriculture

**O Section on Agriculture**—9:00 A.M.; Symposium: Agronomic Problems of the Northeastern States, Part III; Room F, Mechanics Building.

#### Industrial Science

**P, X14 Section on Industrial Science**; *Fortune Magazine*; and *The New England Council*—9:30 A.M.; Symposium: Identification and Development of Senior Executives in American Industry: Contributions of Modern Science, Part I; Louis XIV Ballroom, Somerset.

**P1, P American Industrial Hygiene Association**; and *Section on Industrial Science*—10:00 A.M.; Contributed Papers; Princess Ballroom, Somerset.

## Education

**Q** *Section on Education*—9:00 A.M.; Concurrent Session 1; Panel: Why Teachers Do or Do Not Use Films; Parlor A, Bradford. 9:00 A.M.; Concurrent Session 2; Symposium: Visual Efficiency in Industry, Part I; Parlor B, Bradford.

**FG7** *National Association of Biology Teachers*—8:00 A.M.; Meeting of Executive Board; Drawing Room, Bradford.

**FG7, Q3, X3, Q1** *National Association of Biology Teachers; National Science Teachers Association; American Nature Study Society; and AAAS Cooperative Committee*—8:30 A.M.; Science Teaching Films; Lobby Salon, Bradford. 9:30 A.M.; New Developments from Research into Resources of the Water; Lobby Salon, Bradford.

## Science in General

**X17** *Society of the Sigma Xi*—10:00 A.M.; 54th Annual Convention; Room 1, Harvard Club.

## Tuesday Noon and Afternoon

### AAAS as a Whole

*AAAS General Symposium*—2:00 P.M.; The Sea Frontier, Part II; Paul Revere Hall, Mechanics Building.

### Physics

**B, FG3** *Section on Physics; and American Society of Naturalists*—2:00 P.M.; Symposium: Physics in Biology, Part II; Room E, Mechanics Building.

**B1** *American Meteorological Society*—2:00 P.M.; Cloud Physics, Part II; Crystal Ballroom, Kenmore.

### Chemistry

**C1** *Alpha Chi Sigma*—12:30 P.M.; Luncheon Meeting; Parlor 131, Sheraton Plaza.

**C** *Section on Chemistry*—2:00 P.M.; Symposium: Recent Advances in Food Technology; Room C, Mechanics Building.

### Geology and Geography

**E, M, P, E2, E1, X4** *Section on Geology and Geography; Section on Engineering; Section on Industrial Science; Geological Society of America; New England Division, Association of American Geographers; and American Geophysical Union*—2:00 P.M.; Symposium: Water for Industry, Part II; Jacob Sleeper Hall, Boston University Junior College.

**E5** *Society of Exploration Geophysicists*—2:30 P.M.; Technical Session; Balinese Room, Somerset.

### Zoological Sciences

**F1** *American Society of Zoologists*—12:30 P.M.; Luncheon for Animal Behaviorists and Sociobiologists; Music Box Room, Copley Square. 2:00 P.M.; Concurrent Session 2; Embryology; Ballroom Assembly, Statler. 2:00 P.M.; Concurrent Session 3; Cytology; Parlor A, Statler. 2:00 P.M.; Concurrent Session 4; General and Mammalian Physiology; Parlor B, Statler.

**F4** *Society of Systematic Zoology*—2:00 P.M.; Council Meeting II; Room of Secretary, Statler.

### Biological Sciences

**FG2, FG1** *American Society of Human Genetics; and American Eugenics Society*—2:00 P.M.; Symposium: Genetic Factors Affecting Intelligence; Oval Room, Sheraton Plaza.

**FG4** *Beta Beta Beta*—12:15 P.M.; Luncheon; Ballroom Foyer, Sheraton Plaza. 1:00 P.M.; Convention Address; Ballroom Foyer, Sheraton Plaza. 2:00 P.M.; Business Session; Ballroom Foyer, Sheraton Plaza.

**FG6** *Genetics Society of America*—1:00 P.M.; Luncheon and Business Meeting; Ballroom, Continental, Cambridge. 3:00 P.M.; Demonstration Papers; Room 182, Biological Laboratories, Harvard.

### Botanical Sciences

**G, G1** *Section on Botanical Sciences; and New England Section of American Society of Plant Physiologists*—2:00 P.M.; Symposium: The Uses of Large Scale Algal Cultures, Part II; Hub Room, Sheraton Plaza.

### Psychology

**I, F1** *Section on Psychology; and American Society of Zoologists*—2:00 P.M.; Invited Papers; Comparative Studies of Social Behavior; Room A, Mechanics Building.

### Social and Economic Sciences

**K3** *Pi Gamma Mu, National Social Science Honor Society*—12:30 P.M.; Luncheon; Town Room, Somerset.

**K2, K, M, K3** *National Academy of Economics and Political Science; Section on Social and Economic Sciences; Section on Engineering; and Pi Gamma Mu*—2:00 P.M.; Symposium: Scientific Research and National Security; Country Room, Somerset.

### History and Philosophy of Science

**L, Q** *Section on History and Philosophy of Science; and Section on Education*—2:00 P.M.; Symposium: Science and General Education; State Suite, Sheraton Plaza.

### Medical Sciences

**Nm** *Subsection on Medicine*—2:00 P.M.; Symposium: Antimetabolites and Cancer, Part IV; Talbot Hall, Mechanics Building.

**Nd, N15** *Subsection on Dentistry; and International Association for Dental Research, North American Division*—2:00 P.M.; Symposium: Pathologic Disturbances of the Dental Pulp Resulting from Dental Operative Procedures; Lecture Hall, Harvard School of Dental Medicine.

**Np, N11, N14, N6, N8, N9, N12** *Subsection on Pharmacy; American Pharmaceutical Association, Scientific Section; American Society of Hospital Pharmacists; American Association of Colleges of Pharmacy; American College of Apothecaries; American Drug Manufacturers Association; and American Pharmaceutical Manufacturers Association*—2:00 P.M.; Contributed Papers; Room D, Mechanics Building. 3:00 P.M.; Symposium: Accreditation of Hospitals: Its Effects on Pharmaceutical Services and Better Patient Care; Room D, Mechanics Building.

**N4** *Alpha Epsilon Delta National Premedical Honor Society*—12:15 P.M.; Luncheon and Session; Parlor C, Statler.

### Agriculture

**O** *Section on Agriculture*—2:00 P.M.; Symposium: Agronomic Problems of the Northeastern States, Part IV; Room F, Mechanics Building.

### Industrial Science

**P, X14** *Section on Industrial Science; Fortune Magazine; and The New England Council*—12:30 P.M.; Luncheon and Address; Louis XIV Ballroom, Somerset. 2:30 P.M.; Symposium: Identification and Development of Senior Executives in American Industry; Contributions of Modern Science, Part II; Louis XIV Ballroom, Somerset.

**P1, P** *American Industrial Hygiene Association; and Section on Industrial Science*—2:00 P.M.; Contributed Papers; Princess Ballroom, Somerset.

### Education

**Q** *Section on Education*—2:00 P.M.; Symposium: Visual Efficiency in Industry, Part II; Parlor B, Bradford.

**Q, Q2** *Section on Education; and American Educational Research Association*—2:00 P.M.; Symposium: Research on Higher Mental Processes; Parlor A, Bradford.

**FG7** *National Association of Biology Teachers*—



2:00 P.M.; Your Biology Class Room Problems; Reception Room, Bradford. 3:35 P.M.; Reports of Chairman of Group Work; Reception Room, Bradford.

**Q3 National Science Teachers Association**—2:00 P.M.; Concurrent Session 1; Elementary Program; Roof Ballroom, Bradford. 2:00 P.M.; Concurrent Session 2; Secondary Program; Lobby Salon, Bradford.

**X5 American Nature Study Society**—2:00 P.M.; Symposium: Some Practical Applications of Ecology; Governor Bradford Room, Bradford.

#### Science in General

**X10 Honor Society of Phi Kappa Phi**—1:30 P.M.; Business Meeting; Parlor F, Statler.

**X17, X16 Society of the Sigma Xi**; and *Scientific Research Society of America*—12:30 P.M.; Joint Luncheon; Library, Harvard Club.

**X16 Scientific Research Society of America**—4:00 P.M.; Annual Convention; Library, Harvard Club.

**X17 Society of the Sigma Xi**—2:00 P.M.; 54th Annual Convention (reconvened); Library, Harvard Club.

#### Tuesday Evening

##### AAAS as a Whole

**AAAS, K AAAS Symposium Committee**; and *Section on Social and Economic Sciences*—8:00 P.M.; The Scientist in American Society, Part II; Paul Revere Hall, Mechanics Building.

**X16 Scientific Research Society of America**—8:00 P.M.; Annual Address and Award of William Proctor Prize; Ballroom, Statler.

**FG3, AAAS American Society of Naturalists**; and *AAAS*—8:30 to 11:30 P.M.; Biologists' Smoker; Grand Hall, Mechanics Building.

#### Chemistry

**C Section on Chemistry**—6:30 P.M.; Chemists' Dinner and Vice Presidential Address; Bay State Room, Statler.

#### Zoological Sciences

**F1, F American Society of Zoologists**; and *Section on Zoological Sciences*—6:00 P.M.; Zoologists' Dinner and Section F Vice Presidential Address; Georgian Room, Statler.

#### Biological Sciences

**FG2, FG6 American Society of Human Genetics**; and *Genetics Society of America*—6:00 P.M.; Geneticists' Dinner and Presidential Address; Music Box Room, Copley Square.

#### Medical Sciences

**Nd, N15 Subsection on Dentistry**; and *International Association for Dental Research, North American Division*—8:00 P.M.; Symposium: Periodontia; Lecture Hall, Harvard School of Dental Medicine.

#### Education

**FG7 National Association of Biology Teachers**—8:00 P.M.; Meeting of Executive Board; Drawing Room, Bradford. 8:00 P.M.; Meeting of Editorial Board; Conference Room, Bradford.

**Q3 National Science Teachers Association**—7:30 P.M.; Executive Committee Meeting; Room 520, Bradford.

**X1 Academy Conference**—7:30 P.M.; Junior Scientists Assembly; Lobby Salon, Bradford.

#### Wednesday, December 30

##### Wednesday Morning

##### AAAS as a Whole

**AAAS Council Meeting II**—9:00 A.M.; Parlor A, Statler.

#### Physics

**B1 American Meteorological Society**—9:00 A.M.; Synoptic Meteorology; Crystal Ballroom, Kenmore.

**X4 American Geophysical Union**—9:30 A.M.; Contributed Papers; Balinese Room, Somerset.

#### Chemistry

**C, G, O Section on Chemistry**; *Section on Botanical Sciences*; and *Section on Agriculture*—9:30 A.M.; Symposium: Growth and Nutrition of Plants; Room C, Mechanics Building.

#### Astronomy

**D, B, E Section on Astronomy**; *Section on Physics*; and *Section on Geology and Geography*—9:00 A.M.; Symposium: Origin of Meteorites, Part I; Lecture Hall, American Academy of Arts and Sciences.

#### Geology and Geography

**E, K, E1 Section on Geology and Geography**; *Section on Social and Economic Sciences*; and *New England Division, Association of American Geographers*—9:30 A.M.; Symposium: The Metropolis; Room D, Mechanics Building.

#### Zoological Sciences

**F1 American Society of Zoologists**—9:00 A.M.; Presidential Symposium: Bioluminescence as a Tool in the Study of Cell Processes; Ballroom, Statler.

#### Biological Sciences

**FG2 American Society of Human Genetics**—9:00 A.M.; Contributed Papers; Oval Room, Sheraton Plaza.

**FG6 Genetics Society of America**—9:00 A.M.; Concurrent Session 1; Short Papers; Ballroom Foyer, Sheraton Plaza. 9:00 A.M.; Concurrent Session 2; Short Papers; Hub Room, Sheraton Plaza.

**FG8 Society for the Study of Evolution**—8:30 A.M.; Council Meeting; Copley Room, Sheraton Plaza. 9:30 A.M.; Annual Business Meeting; Copley Room, Sheraton Plaza. 10:00 A.M.; Contributed Papers; Copley Room, Sheraton Plaza.

#### Psychology

**I Section on Psychology**—9:30 A.M.; Invited Papers: Human Engineering and Information Theory; Room A, Mechanics Building.

#### Social and Economic Sciences

**K1, L2 Committee for Social Physics**; and *Institute for the Unity of Science*—9:30 A.M.; Tentative Presentation of the General Principles of Social Physics; Country Room, Somerset.

#### Medical Sciences

**N7 American Association of Hospital Consultants**—9:30 A.M.; Symposium: The Research Function of the Hospital; Parlor C, Statler.

**N13 American Psychiatric Association**—9:30 A.M.; Contributed Papers; Bay State Room, Statler.

#### Industrial Science

**P1, N American Industrial Hygiene Association**; and *Section on Medical Sciences*—10:00 A.M.; Invited Papers; Princess Ballroom, Somerset.

#### Education

**Q Section on Education**—9:00 A.M.; Concurrent Session 1; Contributed Papers; Oval Room, Bradford. 9:00 A.M.; Concurrent Session 2; Contributed Papers; Glass Room, Bradford.

**FG7, Q3, X5 National Association of Biology Teachers**; *National Science Teachers Association*; and *American Nature Study Society*—8:00 A.M.; Meeting of the Officers to plan the 1954 coordinated program; Conference Room, Bradford.

**FG7, X5 National Association of Biology Teachers;** and *American Nature Study Society*—9:00 A.M.; Departure of Joint Field Trip; Lobby, Bradford.

**Q3 National Science Teachers Association**—9:30 A.M.; Inside NSTA; Governor Bradford Room, Bradford.

#### Science in General

**X10 Honor Society of Phi Kappa Phi**—8:00 A.M.; Breakfast; Parlor F, Statler. 9:00 A.M.; Business Meeting; Parlor F, Statler.

#### Wednesday Noon and Afternoon

##### AAAS as a Whole

*AAAS Section Officers Luncheon and Business Meeting*—12:00 noon; Parlor B, Statler.

##### Physics

**X4 American Geophysical Union**—1:30 P.M.; Contributed Papers; Balinese Room, Somerset.

##### Chemistry

**C Section on Chemistry**—2:00 P.M.; Symposium: Chemistry of the Sea as Related to Food Problems; Room C, Mechanics Building.

##### Astronomy

**D, B, E Section on Astronomy; Section on Physics; and Section on Geology and Geography**—12:30 P.M.; Luncheon; American Academy of Arts and Sciences. 1:30 P.M.; Symposium: Origin of Meteorites, Part II; Lecture Hall, American Academy of Arts and Sciences.

##### Geology and Geography

**E, E2 Section on Geology and Geography; and Geological Society of America**—2:00 P.M.; General Geology; Room E, Mechanics Building.

**E, E1 Section on Geology and Geography; and New England Division, Association of American Geographers**—2:00 P.M.; General Geography; Room D, Mechanics Building.

##### Zoological Sciences

**F1 American Society of Zoologists**—2:00 P.M.; Concurrent Session 1; Motion Pictures; Dorrance Building, Massachusetts Institute of Technology. 2:00 P.M.; Concurrent Session 2; Demonstrations; Dorrance Building, Massachusetts Institute of Technology. 4:30 P.M.; Panel Discussion: The Teaching of the Physiological Sciences at the Undergraduate Level; Dorrance Building, Massachusetts Institute of Technology.

**F4 Society of Systematic Zoology**—2:00 P.M.; Symposium: The Subspecies versus the Cline: Their Biological and Nomenclatural Significance; Georgian Room, Statler.

##### Biological Sciences

**FG2, FG6, FG8, H American Society of Human Genetics; Genetics Society of America; Society for the Study of Evolution; and Section on Anthropology**—2:00 P.M.; Symposium: Genetics and the Races of Man; Ballroom, Sheraton Plaza.

##### Psychology

**I Section on Psychology**—2:00 P.M.; Invited Papers: Sensory Processes; Room A, Mechanics Building. 4:30 P.M.; Vice Presidential Address; Room A, Mechanics Building.

##### Social and Economic Sciences

**K1 Committee for Social Physics**—2:00 P.M.; Some Indicated Areas of Application of Social Physics; Country Room, Somerset.

**K4, K Society for the Advancement of Criminology; and Section on Social and Economic Sciences**—2:00 P.M.;

Symposium: A Scientific Approach to the Problems of Delinquency; Louis XIV Ballroom, Somerset.

##### Engineering

**M Section on Engineering**—2:00 P.M.; Symposium: Conservation of Human Resources: Highway Safety, Part I; Princess Ballroom, Somerset.

##### Medical Sciences

**N5 American Academy of Forensic Sciences**—2:00 P.M.; Symposium: Identification of the Dead; Parlor C, Statler.

**N13 American Psychiatric Association**—2:00 P.M.; Round Table Discussion; Bay State Room, Statler.

##### Education

**Q Section on Education**—2:00 P.M.; Invited Papers: Learning Difficulties Among School Children; Oval Room, Bradford. 3:30 P.M.; Vice Presidential Address; Oval Room, Bradford.

#### Wednesday Evening

##### AAAS as a Whole

**X18 United Chapters of Phi Beta Kappa**—Annual Address; 8:30 P.M.; Georgian Room, Statler.

##### Astronomy

**D, B, E Section on Astronomy; Section on Physics; and Section on Geology and Geography**—8:00 P.M.; Symposium: Origin of Meteorites, Part III; Lecture Hall, American Academy of Arts and Sciences.

##### Geology and Geography

**E, E2 Section on Geology and Geography; and Geological Society of America**—8:00 P.M.; Vice Presidential Address and Section E Smoker; Harvard Faculty Club, Cambridge.

##### Biological Sciences

**FG3 American Society of Naturalists**—8:00 P.M.; Naturalists' Dinner and Presidential Address; Music Box Room, Copley Square.

##### Engineering

**M Section on Engineering**—7:30 P.M.; Symposium: Conservation of Human Resources: Highway Safety, Part II; Princess Ballroom, Somerset.

##### Education

**FG7 National Association of Biology Teachers**—8:00 P.M.; Meeting of National Committee for NABT Conservation Project; Drawing Room, Bradford.

#### Thursday, December 31

##### Thursday Morning

##### Education

**FG7 National Association of Biology Teachers**—9:00 A.M.; Workshop in Conservation Education I; Conference Room, Bradford.

##### Thursday Afternoon

##### Education

**FG7 National Association of Biology Teachers**—1:00 P.M.; Workshop in Conservation Education II; Conference Room, Bradford.

##### Thursday Evening

##### Education

**FG7 National Association of Biology Teachers**—7:00 P.M.; Workshop in Conservation Education III; Conference Room, Bradford. **Note:** Sessions IV, V, and VI will continue Friday, Jan. 1, same times, same room.



## ANNUAL EXPOSITION OF SCIENCE AND INDUSTRY

The AAAS Annual Exposition of Science and Industry, which dates back to 1924 (still earlier with certain pioneer exhibitors), has become an important and integral part of the Association's annual meeting. It provides an outstanding opportunity for those who use the tools and materials of science to meet those who produce and distribute the same. The 1953 edition of the Exposition, which occupies the large Exhibition Hall of Boston's Mechanics Building, is up to the same high standard of previous years.

The exhibits include the latest and best in scientific books, instruments, and materials; they are on a scale, and with a diversity, not usually possible at the meeting of an individual society or group of societies in a single field of science. In addition to this "core" of the Exposition, a variety of organizations have special exhibits, and there are technical exhibits by large firms representative of the basic industries of the nation. Prominent concerns in the chemical, pharmaceutical, and other industries are sharing with the attending scientists some of their impressive technological accomplishments. The Exposition should not be missed by anyone who attends this 120th meeting. Your convention badge assures admission.

The AAAS Annual Exposition of Science and Industry fills the Exhibition Hall of the Mechanics Building. The exhibit area, which is on the main floor, is reached through the entrance nearest Copley Square.

The Exposition is open to:

1. All registrants attending the 120th meeting;
2. Interested adults who have applied for, and received, complimentary tickets of admission.

### Hours

Sunday, Dec. 27	2:00 P.M.-8:00 P.M.
Monday, Dec. 28	9:00 A.M.-6:00 P.M.
Tuesday, Dec. 29	9:00 A.M.-9:00 P.M.
Wednesday, Dec. 30	9:00 A.M.-4:00 P.M.

### Directory of Exhibitors

Starting across from the left corner, nearest the entrance, the peripheral booths run clockwise from 1 to 45. Booths 201-237, inclusive, are 8 x 8's, central in position; booths 101-111 are 12 x 8's, between the central stairs to the session rooms and the luncheon facilities.

Booths 23-40 and 112-166 are included in the New England Area. The Local Committee on Exhibits, with Walter S. Baird, president, Baird Associates, Inc., as chairman, and Donald D. Hathaway, also of Baird Associates, Inc., as secretary, has redesigned one area of the Annual Exposition of Science and Industry in a New England Area to emphasize, through industrial and institutional exhibits, New England's position as a world center of scientific and research activity. The exhibits of industry, which will be grouped together with outstanding scientific exhibits of New England's universities and institutions, will be a distinctive feature of the Exposition. This area will be decorated in colors of the spectrum.

As this General Program-Directory goes to press, many of the descriptive writeups of the exhibits of the New England Area have not been received in time to include here.

(Descriptive material prepared by individual exhibitors)

**AAAS New Member Service—SCIENCE—THE SCIENTIFIC MONTHLY (Booths 1 and 2).** There are personal advantages in joining the Association. Every person in attendance at this 120th meeting is cordially invited to visit the New Member Service for information concerning the Association. Since its founding, in 1848, the Association has admitted to membership not only professional scientists but also other men and women who have a general interest in science, who wish to keep informed of the progress of science, and who would like to support the high purposes of the one organization that represents all science.

Included in the annual dues of \$6.50 (for 1954), each member has a choice of a year of *SCIENCE*, the professional scientists' newsworthy, or *THE SCIENTIFIC MONTHLY* (or both for an additional \$3.50). Free sample copies of these two publications will be distributed and all not familiar with both magazines are invited to visit this booth. The Symposium Volumes and other publications of the AAAS are also on display. Prospective advertisers may obtain sample copies of the magazines and rate cards. Members of the AAAS are requested to nominate fellow scientists for membership.

**American Cancer Society, Inc. (Booth 9).** The exhibit of the American Cancer Society depicts the morphological differences between the normal and abnormal cancer cells and indicates the role of many scientific disciplines, such as genetics, viruses, hormones, metabolism, nutrition, isotopes, physics, and chemotherapy, in their relationship with these two types of cells. Elaboration of the role of many of these disciplines is emphasized particularly in the utilization of many new research tools which have been developed in the last 25 years. The exhibit also includes a breakdown of the society's subsidy of cancer research in this country during the past eight years.

**American Institute of Biological Sciences and the U.S.D.A. Library (Booth 3).** This exhibit, sponsored by the Publications Committee of the American Institute of Biological Sciences and the U.S. Department of Agriculture Library, describes an electronic machine, known as the Rapid Selector, for storage, searching, and reproduction of scientific data. The Rapid Selector, first conceived by Dr. Vannevar Bush, stores data on microfilm. Along with each page of data is subject analysis in the form of dot code patterns. The machine photoelectrically matches the dots on the film with holes in a mask, and when the dots and holes match, copies the pertinent frame of data by flash photography. The prototype, which is the only machine of its type in existence, may be seen at the Department of Agriculture Library in Washington, D.C.

**The American National Red Cross (Booth 16).** The Blood Derivative Table Display depicts, in elementary fashion, the basic processes in the preparation of whole blood for use in transfusion. It also portrays some of the processes as well as the indicated uses of the fractionated elements of blood. The exhibit itself is intended as a focal point to stimulate further suggested study of the subject of blood which is contained in booklets (ARC 1721, *Medical Uses of Blood*; ARC 1731, *Blood and the Nation's Health*; P. A. Pamphlet #145, *Blood's Magic for All*).

As a result of previous showings, we have had requests from individual students and from schools for additional information which would provide raw material for sample scientific investigations on blood.

**American Optical Company, Instrument Division (Booth 111).** Several new and interesting developments will be shown and demonstrated. The new hand-operated AO Sterile Fluids Pump, used for intra-arterial infusions of blood, plasma, etc., and of particular interest to laboratories for moving small quantities of sterile fluids from one vessel to another, will be demonstrated. A standard AO Spencer Laboratory Microscope will be shown with the new auxiliary condenser. This provides full field illumination of all the low power objectives. In addition, a binocular microscope with the new and improved No. 700 Attachable Illuminator, which is now equipped with a low priced bulb, built-in condenser and removable filters, will also be demonstrated. The new AO Phase Bright-Line Haemacytometer, the AO Photomicrographic Camera with some modifications and improvements, also the low priced AO Spencer P45 Polarizing Microscope will be on display. Representatives O. E. Schaefer, N. J. Blaiklock, and R. I. Schiff will be on hand to demonstrate and discuss the many improvements and outstanding advantages of AO instruments.

**The American Tobacco Company, Incorporated (Booths 5 and 6).** The Research Laboratory of The American Tobacco Company will demonstrate its new type smoking machine which has been simplified in design and construction by the utilization of readily available components. This instrument simulates human smoking and is designed to facilitate investigations of the properties of tobacco smoke by making possible a reproducible collection of smoke for analysis. Through basic research in this field, means have been found for the scientific selection of tobaccos and the control of quality in manufacture of *Lucky Strike* cigarettes.

**Association of American University Presses (Booth 41).** You are welcome to examine the following new university press titles and many others at our booth. Baitwell: *Science in Progress, Eighth Series*; Drake: *Galileo's Dialogue Concerning the Two Chief World Systems*; Fisher: *Applied Electron Microscopy*; Gellhorn: *Physiological Foundations of Neurology and Psychiatry*; Hassmann: *Oil in the Soviet Union*; Ingold: *Structure and Mechanism in Organic Chemistry*; Jennings: *Wild Flowers of Western Pennsylvania and the Upper Ohio Basin*; Jewett: *Birds of Washington State*; Kuiper: *The Solar System*; Leicester: *Chymia*; Loomis: *Growth and Differentiation in Plants*; Lyttleton: *The Comets and Their Origin*; Mueller: *Goethe's Botanical Writings*; Quastler: *Information Theory in Biology*; Rogers: *Your Diabetes and How to Live With it*; Shapley: *Climatic Change*; Strughold: *The Green and Red Planet*; Turney: *Chateau-Gerard*; Wiggins: *Current Biological Research in the Alaskan Arctic*; Williams: *Free and Equal*.

**Atomic Instrument Company (Booth 150).** The Atomic Instrument Company exhibit represents a cross-section of its products in the fields of nuclear research instrumentation and electronic counting and control for industry and science. Several instruments incorporating the "Dekatron" cold cathode glow transfer counting tube are included in the demonstration. These include both straight counters and pre-set counters. Atomic's nuclear instruments range from a small "gun-type" Logarithmic Survey Meter to large units such as the Twenty Channel Differential Pulse Height Analyzer or the highspeed Dataprinter. Visitors are cordially invited to visit the company's facilities at 84 Massachusetts Avenue in Cambridge (directly opposite the Massachusetts Institute of Technology).

**Badger Manufacturing Company (Booth 142).**

**Baird Associates, Inc. (Booths 165 and 166).** For fifteen years, Baird Associates has been an engineering research and manufacturing institution in Cambridge, Massachusetts. The firm was originally organized by Walter S. Baird and John Sterner, now president and vice president, respectively, of the corporation.

The initial product of Baird Associates was designed and fabricated by Doctors Baird and Sterner. It was the first grating spectrograph of commercial significance, and that instrument, augmented by associated accessory equipment, is today one of the company's standard items. An outgrowth of this spectrograph is the Direct Reading Spectrometer, which is used for spectrochemical analysis of up to 18 elements in a metal sample, reading on dials directly in percent concentration. Instruments operating on the infrared absorption principle provide a means for organic chemical analysis. The Process Controls Analyzer monitors one element in a continuous gas stream, while the Infrared Recording Spectrophotometer gives a qualitative and quantitative analysis on a batch sampling basis. Other commercial products include the Flame Photometer, Interferometer, Dermal Radiometer, Roentgenogram Projector, and a wide variety of allied electronic-optical accessories for the major instruments.

Baird Associates' Research Department is well known for its approach to the problems of physical optics and precision instrumentation for the Department of Defense and many private clients. The scope of the Research Department, which employs one-quarter of the company's total personnel, includes the selection, detection, and measurement of electromagnetic radiation in wavelength regions from soft x-rays to microwaves. On a commercial basis, Research produces and sells HG 198 monoisotope lamps, bolometers, filters, sound-on-film modulators, and diffraction gratings. The company also produces surface finish standards, computers, periscopes, and transistor circuitry.

**Bausch & Lomb Optical Co. (Booths 232 and 233).** The new Bausch & Lomb Certified-Precision Diffraction Gratings will be demonstrated. Practical applications of these gratings, too, will be shown in the Grating Monochromator. In addition, the new Transistor Microscope will enable you to examine the construction of transistors, and see for yourself the value of stereomicroscopes in these intricate small parts assemblies. Of course, the leading line of laboratory and research microscopes, popular low priced microscope illuminators, and interference filters will be in the working display. Stop in at the booth for assistance in solving your problems, optically.

**The Bettinger Corporation (Booths 158 and 173).** One of the outstanding contributions to the national defense production has been the application of ceramic coatings to low alloy metals to conserve such critical and strategic elements as columbium, cobalt, tungsten, chromium, and nickel. General Electric, which has been awarded a contract by the Air Force to push this idea beyond the laboratory stage, had heard of Bettinger's research in the high temperature field. The investigation by General Electric resulted in the awarding of a contract to Bettinger to apply ceramic coatings on turbosupercharge parts. These high temperature coatings have proved so successful that they have been incorporated in many hot jet engine parts and have been one of the contributions toward adding longer life to jet engines. Bettinger has now applied its services to combating the many industrial corrosion problems.

**The Blakiston Company, Inc. (Booth 217).** Make a date to meet your friends here and see the important Blakiston science books. Arranged for easy reading in page proof form you will find: *The Microtome's Formulary and Guide* by Gray, *Vegetable and Flower Seed Production* by Hawthorne and Pollard, and the new second edition of *Histopathologic Technic* by Lillie. These will be published in the spring of 1954. Here for examination and ready for spring classes you will find *Within the Living Plant* by Miller, *Textbook of Histology* by Greep, and *Biological Conservation* by Black. Other books you will want to see are, the new second edition of *Human Embryology* by Patten, the new second edition of *Diseases of the Retina* by Elwyn, the new eleventh edition of *Morris' Human Anatomy, Comparative Embryology of the Vertebrates* by Nelsen, *Physics for Science and Engineering Students* by Furry, Purcell, and Street, *Biological Chemistry* by Gero, and *General College Chemistry* by Brescia. Blakiston's science editor, William Keller, new sales manager, Don Hicks, and New England representative, Al Bodian, will be on hand to discuss these and other distinguished volumes on display.

**Bowen Corporation (Booth 157).**

**Brookfield Engineering Laboratories, Inc. (Booth 229).** It is planned to exhibit two instruments of interest to those engaged in the study of rheology—the flow and deformation of matter.

The newly developed Brookfield Stress Strain Analyzer will be shown in operation. This unit was designed to test and record the deformation of a gel structure as well as its yield point under a continuously increasing stress. It is believed to represent an important advance in this field.

A laboratory adaptation of the Brookfield Viscometran will also be shown. Designed as a continuous recording laboratory viscometer, its use with an XY strip chart recorder permits the accurate and faithful plotting of rheological curves. This unit will be exhibited with a Brookfield Helipath Stand—the combination permitting an investigation of the setting rates of such materials as Portland cement mixes, etc.

**Brown Company (Booths 28, 29, 30, and 31).**

**Godfrey L. Cabot, Inc. (Booth 35).**

**J. S. Canner & Company, Inc. (Booth 203).** Our exhibit will be held in cooperation with the Microcard Foundation, and will display publications in microcard form as issued by the Foundation and by our own firm, as well as the readers used in connection with such publications. We will also have on hand lists of microcard titles available, and catalogues showing what we can offer in the field of serial and periodical publications. We are library booksellers, specializing in sets and back files of periodicals in science, technology, humanities, and major works of reference.

**The Charles River Breeding Labs., Inc. (Booth 7).** The Charles River Breeding Laboratories of Brookline and North Wilmington, Mass., will have present the firm's president, Henry Foster. Dr. Foster will be at the show specifically to talk over problems met by laboratory technicians and specialists using rats for medical research. The Charles River Breeding Laboratories have met and solved successfully problems experienced by some of the country's largest laboratories utilizing rats. By means of stereoscopic slides, in color, and a 16-mm film, the breed-

ing and processing of albino rats will be shown to those interested. Also available at the booth will be samples of the specially designed shipping containers shipped all over the country by the firm; and distributed free of cost will be the Charles River Breeding Laboratory's latest illustrated literature, a unique artist's drawing of the rat breeding cycle, a striking symbolic pencil sketch the size of a newspaper page, with interesting facts about the company, largest of its kind in the East.

**The Coca-Cola Company (Lounge Area).** Ice-cold Coca-Cola will be served through the courtesy and cooperation of the Coca-Cola Bottling Company of Boston and The Coca-Cola Company.

**Control Engineering Corporation (Booth 118).** The Control Engineering Corporation has pioneered in the development of pressure and flow-measuring instruments and devices. Several new tools for the process industries are exhibited. The outstanding item displayed is an industrial type inertial flowmeter for measuring mass flow rates of fluids, which is completely independent of pressure, viscosity, density, compressibility, temperature, and nonhomogeneity. The versatile performance of this meter gained by these ideal properties make it useful in a broad range of applications. Also displayed is a device which represents a significant advance in the measurement of dynamic pressures at extremely high temperatures. This water-cooled-pressure-pickup puts a new weapon in the hands of research engineers who have been plagued by the problem of obtaining reliable pressure measurements in high temperature systems. It is expected to be particularly useful in current research activities on rocket propellants.

**Denoyer-Geppert Company (Booth 17).** The Denoyer-Geppert Company will exhibit representative samples of its line of visual aids to the teaching of all aspects of biological science, including models, charts, skeletons, and other osteological preparations, demonstration mounts, corrosion specimens, laboratory manuals, and test sheets. Imported charts from the many D-G contacts with the foreign market will be on display and available for inspection. The famous Kampmeier-Lariviere Functional Human Anatomy Charts and the recently introduced CS250 Cartocraft Slated Human Skeleton Chart will be featured.

**J. H. Emerson Company (Booth 4).** The Emerson Micromanipulator will be shown. In this unique instrument all horizontal motions are coordinated by one control lever, so that the apparent motion of micro-instruments in the field of a compound microscope is identical with the actual motion of the "joy stick." The ratio of instrument travel to hand motion, moreover, is quickly adjustable, to allow for changes between low and high power. There are also vertical controls and convenient coarse adjustments.

**Federal Reserve Bank of Boston (Booth 123).** The exhibit of the Federal Reserve Bank of Boston will be developed around the theme: "Economic Research—What It Means to You." A series of seven panels will portray graphically the part which economic research plays in helping bankers and businessmen to promote a healthy New England economy. Additional displays of charts and publications will illustrate the scope of the activities of the bank's Research and Statistics Department.

**Fenwal Corporation (Booths 37 and 38).**

**Folkway Records & Service Corp. (Booth 236).** Folkways Records is the world's leading producer of authentic folk music on records including The Ethnic Folkways Library which contains an unusual selection of music of over 100 cultures. Recorded on location by native orchestras and vocal groups, each long play record is accompanied by extensive notes by famous collectors and recognized authorities. The Science Series on Folkway Records presents natural sound phenomena found on the earth, in the sea, and in the sky, and demonstrates human, natural, man-made, and location sounds. Many of the issues are original recordings on high fidelity—40–18,000 cycles. All Folkways Records are guaranteed for quality of reproduction and content. The address of Folkway Records is 117 West 46th Street, New York 36, New York.

**General Radio Company (Booth 119).** The General Radio Company was incorporated in 1915 and continuously since that time has specialized in the design and manufacture of electronic apparatus for science and industry. As such, it is the oldest electronics firm in America and is the largest in its field. The Company has been responsible for the introduction of many instruments which have since become standard in electronic laboratories. Among them are these now well-known items: the standard-signal generator, the beat-frequency oscillator, the cathode-ray oscillograph, the sound-level meter, the Variac® continuously adjustable autotransformer, and the Strobotac®, an electronic flash stroboscope.

In recent years scientists working in other fields, such as mechanics, chemistry, hydrodynamics, and medicine, have utilized GR instruments to perform investigations which can be best, or in many cases, only, made by the use of electronic measuring techniques. The latest designs of many of these instruments are listed in the Company's present catalog, which includes several hundred instruments and precision components. Among recent developments are the new UHF coaxial connectors, pulse generators, random-noise generators, motor speed controls, and many other devices to meet the rapidly growing demands of science and engineering.

**Arnold Greene & Company (Booth 124).** Our exhibit will consist of photographs and radiographs of parts with defects that were not visible until the magnetic particle inspection method, the fluorescent penetrant method, or radiography were used to show hidden defects. We will also have a mechanized exhibit showing how the magnetic particle inspection method operates, as well as the difference in surface appearance of indications brought out by the fluorescent penetrant method. Industrial x-ray equipment will be in operation whereby we will be able to make radiographs of certain sample parts for viewing by interested persons.

In attendance at all times will be laboratory personnel who will be able to discuss with interested persons our method of flow detection through nondestructive testing and other types of laboratory testing equipment. Test cases where our customers have been able to eliminate loss through our type of laboratory inspection will be available for the general public's information.

**Harvard Apparatus Company, Inc. (Booth 8).** Visitors seldom reach our considerably isolated plant. Our product of physiological apparatus is therefore to be seen largely through exhibits. For that reason we have, as on this occasion, adopted the policy of showing the complete line, including new items under way or stocked for delivery.

**Karl Heitz, Inc. (Booth 214).** Karl Heitz, distributors of Swiss precision equipment, will exhibit: *Alpa* 35-mm camera, designed for the scientific and industrial photographers (but also for private use), with unique combination of *Kern* reflex-prism (brilliant, life-size ground glass image) plus individual range finder. Each of the coated, highest resolving power lenses is not only inspected in the lens factory, but also individually tested in the *Alpa* research laboratory. Their focal length ranges from 28-mm up to 2000-mm and includes the famous *Kern* Switar 50-mm *f*/1.8, first and only true *Apochromat* in 35-mm history, correcting all 3 primary colors and rendering critical sharpness at full aperture. *Alpa* lenses have more than twice the extension range than other lenses allowing continuous focusing from infinity to ultra close-ups. Accessories include: bellows attachment, copy and close-up stand with annular lamp, focusable object table, double-sided mirror and groundspikes for outdoor use, photomicrographic attachment, *Kern* Colpograph. Further, we will demonstrate *Kebikoff* color temperature meter for determining exact color temperature of any light source; *Hilba Color Lux* and *Metraphot* incident light and exposure meters; *Cobivue* opaque and slide projector; *Lindia* snap-in slide mounts; *Omag* pocket microscopes for both indoor (AC current) and outdoor (batteries) use; *Kern* prismatic binocular microscopes for stereoscopic viewing of reinverted image, with wide field of view and ample working space, six different stands and four different lights provide for any practical application; *Kern* binoculars and monoculars with top quality, coated *Kern* lenses and prisms, "featherlight"; *Kern* optical flats for testing flatness of highly polished surfaces; *Kern* Superstroboscope for observing or photographing rapidly occurring phenomena of a periodic or aperiodic nature; and *Kern* apochromatic lenses.

**High Voltage Engineering Corporation (Booth 149).** High Voltage Engineering Corporation is concerned with the design and manufacture of particle-acceleration equipment for precision research and industrial applications of high-power nuclear radiations. At the HVEC plant in Cambridge, Mass., several Van de Graaf accelerators in the 1–6-million-volt range are currently being constructed for cancer therapy, industrial radiography, radiation chemistry, and nuclear research. In addition, a 50-million-volt electron linear accelerator for medical research is under development. The company's exhibit will demonstrate the versatility of the Van de Graaf acceleration systems. A new, compact, 1-million-volt Van de Graaf radiation source will be described. Scientific and technical representatives will be on hand to discuss radiation research problems with visitors.

**Houghton Mifflin Company (Booth 230).** Houghton Mifflin will have a display of textbooks and general reference materials in science, mathematics, and related subjects having a wide distribution in secondary schools, colleges, and universities throughout the country.

**International Equipment Company (Booth 126).** The International Equipment Company will feature the new Model PR-2 Refrigerated Centrifuge and accessories. This new model offers greater capacity, higher speed, lower temperature, and greater versatility than ever before obtainable with this type of centrifuge. The latest models of laboratory centrifuges will also be shown, together with new accessories recently designed including a new line of sealed accessories for centrifuging infectious materials. The international ultra-thin sectioning microtome will also be displayed. This instrument is designed



for cutting sections in the range of 1/40 and 1/20 of a micron.

**Ionics, Inc. (Booth 134).**

The Kennel Food Supply Company, Inc. (Booth A). The Kennel Food Supply Company, Inc. began to manufacture special animal diets in 1890 and has the honor of being the oldest manufacturer of these products in the U.S. The plant is located on the bank of a picturesque stream in the historical town of Fairfield, Conn.

Many laboratories have experienced trouble with commercial diets due to the manufacturer substituting cheaper ingredients whenever market prices rise. The Kennel Food Supply Company has the reputation of following a proven correct formula—never making a change in the quality of the ingredients or the amount. Laboratories may have any information in regard to ingredients and analysis.

Chim Crackers is one of our outstanding special diets developed by the Yerkes Laboratories of Primate Biology, Orange Park, Fla. We have been making this diet for monkeys and chimpanzees for many years. It is a basic diet except for leafy greens. Chim Crackers are baked fresh on order. All ingredients are of the highest quality obtainable, blended together, and slow-baked over coal fires. They are available in biscuit form and, as we consider size an important factor, these are made  $2 \times 4 \times \frac{1}{2}$ . Chim Crackers are used by a great many outstanding college, university, and private laboratories, and Kennel Food Supply is very proud that the government agencies use them in feeding their primate colonies.

The Kennel Food Supply Company also makes rat and mouse food, pellets or meal, based on a formula prepared by an outstanding medical research laboratory. These pellets are used by a great many outstanding college, university, private, and government laboratories. Again in the making of these pellets the formula is the same, never changing the high quality of the ingredients, or amount of ingredients.

*Of particular interest to the attendance at the Exposition will be the two trained chimpanzees which we will have at our booth on Dec. 28 and 29.*

**Kontes Glass Company (Booth 10).**

**E. Leitz, Inc. (Booth 220).**

Liberty Mutual Insurance Company (Booth 167). In the 41 years since 1912, Liberty Mutual has become the largest mutual casualty insurance company in the world. Along the way it pioneered many insurance innovations; loss prevention, rehabilitation, claims, and medical methods. Realizing the responsibility of its position, Liberty Mutual has pitted time, money, and research against the dangers of the industrial age. The devices on display at the Exposition of New England Science and Industry are working examples of Liberty Mutual's dedication to a path of "making the world a safer place." Work expends energy. Energy expenditure brings on fatigue. Fatigue causes accidents. These machines, The Performance Indicator and The Differential Flame Oxymeter, were designed to measure work loads and fatigue . . . and reduce accidents.

Little, Brown & Company (Booth 129). Little, Brown and Company extends a hearty and warm welcome to the members of the Association. We hope you have time to visit not only its many historical spots but to browse around the numerous good bookstores located in this city of culture. Little, Brown will have on exhibit not only

scientific and medical books of special interest to members but books of general interest concerning Boston to help you make your visit more informative and delightful.

Arthur D. Little, Inc. (Booths 39 and 40). The Mechanical Division of Arthur D. Little, Inc., Cambridge, Mass., will present a display of liquid helium and cryogenic research equipment. The ADL Collins Helium Cryostat, the basic instrument for cryogenic research, can liquefy helium, hydrogen, and other low-boiling gases and can maintain an internal test chamber from normal room temperatures down to  $456^\circ$  below zero F. The ADL Collins Helium Cryostat, an example of the prototype equipment for basic research developed at Arthur D. Little, Inc., has brought the entire field of low-temperature research into the range of every-day investigation and use. Previous to the development of the instrument, phenomena which are known to occur in the neighborhood of absolute zero, such as superconductivity and the spectacular properties of liquid helium, were not actively investigated for useful purposes simply because of the excessive effort required to obtain these low temperatures. Staff members will be in the booth to discuss new developments in cryogenics.

**Lynn Chamber of Commerce (Booths 116 and 117).**

Macalaster Bicknell Company (Booth 204). The Macalaster Bicknell Company will show standard laboratory apparatus and instruments for which we are New England's foremost dealer. We shall also show a few special items of our own manufacture. And it is our hope that arrangements may be completed in time to have an exhibit of scientific glass blowing.

Josiah Macy, Jr., Foundation (Booth 234). You are cordially invited to visit the display of the Transactions of the Conference sponsored by the Josiah Macy, Jr. Foundation. This year we are presenting the transactions of a new conference on administrative medicine. Also available for your examination are publications on adrenal cortex, aging, biological antioxidants, blood clotting, blood pressure, clinical psychology, cold injury, connective tissues, consciousness, cybernetics, infancy and childhood, liver injury, convalescence, metabolic interrelations, nerve impulse, renal function, and shock and circulatory homeostasis. Elizabeth Fuller and Alfred Patten are at the booth to answer your questions and to explain this new style of medical literature. These books are verbatim reports of meetings in which representatives from professions and specialties relevant to the topic participated in lively and informal discussions of methods, theories, and research plans. Much of the material contained in these transactions is unobtainable elsewhere in the literature. The transactions in their present form offer, as well, interesting insight into the broad problem of communication and integration between disciplines, a question of importance to the advancement of the whole of science. In order to make these books available to the greatest number of those interested, the Foundation offers them for sale at cost.

Massachusetts Indemnity Insurance Company (Booth 27). The Massachusetts Indemnity Insurance Company has for many years specialized in unexcelled income protection designed to secure the individual's greatest asset—his *earning power*. Our plans are *noncancelable, guaranteed renewable to age 60 or 65* (policy-holders option), and *incontestable* like life insurance. We will have available for distribution our famous booklet: "*Facts! Is*

your accident and health policy favorable or unfavorable?" The value of this booklet in its objective analysis of important provisions found in accident and health policies. It's yours for the asking at our exhibit.

**G. & C. Merriam Company (Booth 208).** The G. & C. Merriam Company's exhibit will display copies of the Merriam-Webster publications listed. *Webster's New International Dictionary, Second Edition:* The unabridged work containing 600,000 entries, including thousands of encyclopedic articles, many of them recording a wealth of information in the field of science. *Webster's New Collegiate Dictionary:* Our largest abridged work, completely up to date—copyright 1953. *Webster's Dictionary of Synonyms:* listing synonyms, antonyms, and analogous and contrasted words, explaining the difference in their shades of meaning and illustrating their use. *Webster's Biographical Dictionary:* entering 40,000 biographies of noted men and women of all countries, with name pronunciations. *Webster's Geographical Dictionary:* records information on all the world's important places, with name pronunciations. There will also be shown pamphlet material illustrating and explaining the use of the above publications.

**Monsanto Chemical Company (Booths 205, 206, and 207).** Monsanto will exhibit a gallery of new chemicals which are not in general use in industry. The new compounds will be presented in three-dimensional molecular structures with a list of properties and some suggested uses. The elements in each molecule will be represented by color-coded symbols of a size proportionate to their atomic weights. Approximately forty compounds unexplored by industry will be shown. There will also be an audience participation game emphasizing Monsanto's name and trademark.

**National Cancer Institute, U.S. Public Health Service (Booth 18).** "Half of All Cancer Involves Sites Accessible to Direct Examination," is a new cancer control exhibit designed to encourage the early diagnosis of cancer. It points out to general practitioners the accessible cancer sites in both sexes and charts the percentages of all cancer occurring in the sites. A three-fold leaflet (Public Health Service Publication No. 324), is a facsimile of the exhibit.

**National Geographic Society (Booths 208 and 209).** The exhibit of the National Geographic Society will feature the *National Geographic Magazine* and the *Geographic School Bulletin*. Also on display will be maps, books, pictures, and other special educational materials of the Society. An automatic projector will screen a continuous selection of natural color slides. The slides cover National Geographic field assignments and expeditions and were selected from illustrations by staff photographers of the *National Geographic Magazine*.

**National Research Corporation, Equipment Division (Booth 105).** National Research will exhibit the NRC Vacuum Fusion Gas Analysis apparatus which is used to determine the combined or dissolved gas contents of metals. A wide variety of metals and alloys can be analyzed to determine the amount of oxygen, nitrogen, and hydrogen contained either as combined or dissolved gas, in the range from 1% to approximately 10-4% by weight. The oxygen and hydrogen content of titanium is reported within the same range of accuracy as for other metals. The apparatus incorporates the best features and techniques reported in the literature or known to our lab-

oratory and has been employed for some time in connection with our own metallurgical research activities. The Model 511 "Alphatron" vacuum gage will also be shown; this instrument measures absolute pressures from atmospheric down to 0.0001 mm Hg. NRC will also show several of its line of diffusion pumps. On exhibit will be several smaller oil diffusion pumps and a new glass pump, using mercury as the pumping fluid, which is of particular utility for laboratory vacuum systems.

**National Science Teachers Association (Booth 221).** Highlighting this exhibit will be NSTA's program to encourage closer cooperation between science teachers and industrial, academic, and research scientists. The exhibit will tell the story of the NSTA Packet Service, the Business-Industry Section, *The Science Teacher*, and the Future Scientists of American Foundation. The 1954 program of the Foundation will be featured. This program includes a decisive attack on the problems of identifying, attracting, and keeping more capable boys and girls in the paths that can lead to engineering and scientific careers. Visitors will receive complimentary copies of *Encouraging Future Scientists: The Situation and Encouraging Future Scientists: Available Materials and Services*.

**National Society for Medical Research (Booth 216).** The exhibit of the National Society for Medical Research consists of three panels, each 3'x4', forming a unified display. Both text and illustrations apply to the problem of meeting the threat of antivivisectionism. The exhibit tells why the antivivisectionists are a threat to medical research, why medical research is important, and what must be done to meet the antivivisectionist threat. Key-note of the exhibit is the NSMR logohead, prominently displayed in the upper right hand corner of the exhibit, "Study Life—to Protect Life."

**Naval Ordnance Laboratory (Booth 21).** The Naval Ordnance Laboratory, White Oak, Silver Spring, Md., is a primary ordnance research and development laboratory operating under the Navy's Bureau of Ordnance. NOL's exhibit will show the work of its Magnetic Materials Laboratory, a large and unique installation devoted to the discovery and large scale development of new and improved magnetic materials. Magnetic materials are indispensable to modern living. The telephone, radio, television, electric motors, transformers—an almost infinite array of electrical and electronic equipment, including the very generators which produce electricity—would not be possible without them. NOL's laboratory has developed several magnetic alloys which American industry utilizes. Notable among these are Orthonol, now extensively used commercially in magnetic control amplifiers; Bismanol, recently placed in production; and Alfenol, expected to go into production soon. These three are displayed in the exhibit. A spectator-operated model Navy gun turret, controlled by magnetic amplifiers using Orthonol, will be demonstrated. Magnetic amplifier development, suitable for civilian as well as military application, is another important activity of NOL's Magnetic Materials Laboratory.

**Naval Research Laboratory (Booth 22).** A working model of its recently completed 600-in. radio telescope highlights the exhibit of the Naval Research Laboratory of the Office of Naval Research. This unique instrument has a higher resolving power than any radio telescope in existence today or under construction. The Laboratory's



program in radio astronomy, which was begun in 1946, is concerned with the study of the strength, direction, and variations in radio emissions from the sun, moon, and the galaxy. The objective of this program is to apply to astronomical problems the new and powerful techniques of radio astronomy. By this means, new knowledge has been obtained on the nature of the sun's atmosphere and the structure of the galaxy, and unexpected new objects have been discovered both in and beyond our galaxy. Such information has already had practical application in improving long-range radio communication, a problem of concern to industry as well as to the Armed Forces.

**Personal Photo Service, Inc. (Booth 32).** The exhibit of the Personal Photo Service will have to do with photography in science. The emphasis is placed on the use of high speed lighting as applied to the many problems of the allied fields of science and industry. There will also be displayed new equipment which will be of interest to all. Our organization is prepared to sell and service all of the allied scientific fields in the normal and more technical applications.

**Philosophical Library (Booth 215).**

**Phipps & Bird, Inc. (Booth 101).** For the latest in tools for the biophysicist, you cannot afford to miss Phipps and Bird's exhibit. Our research department has been pretty busy since our last meeting, and you will be sure to find many new and interesting items to assist you in your laboratory. Perhaps you have some special instruments you wish to have built. If so, stop by Phipps and Bird's booth and discuss these with one of our engineers.

**Polaroid Corporation (Booths 23, 24, 25, and 26).** Polaroid Corporation's exhibit will feature applications of polarized light, geometrical optics, and scientific and industrial applications of the picture-in-a-minute process. As a special attraction, 60-sec. pictures will be taken of visitors with the Polaroid Land Camera.

**Potomac River Naval Command, Board of Examiners for Scientific and Technical Personnel (Booth 20).** This Board of Examiners which coordinates recruiting for all scientific and technical personnel for the forty or more naval activities located in the area around and adjacent to Washington, D. C., the Potomac River, and the Chesapeake Bay, will maintain a sound slide projector depicting some of the scientific programs of the major naval laboratories of the Command. Activities to be illustrated include the David Taylor Model Basin, Naval Air Test Center, Naval Gun Factory, Naval Observatory, Naval Ordnance Laboratory, Naval Photographic Center, Naval Powder Factory, Naval Proving Ground, and the Naval Research Laboratory. Two of the laboratories are maintaining special exhibits at the Exposition.

**The Radio Shack (Booth 125).**

**Rawson Electrical Instrument Company (Booth 222).** This company makes a specialty of highly accurate and highly sensitive electrical meters for laboratory use. Most of its output consists of special custom-built instruments. On exhibit will be d'Arsonval DC microammeters and millivoltmeters, multimeters, meters for AC use with internal vacuum thermocouples giving RMS readings. The above high quality meters can be used for general laboratory measurements, or for standards to calibrate meters of lower accuracies. For magnetic measurements, a pivoted

model of the Grassot Fluxmeter will be shown, and also the new Rotating-Coil Gaussmeter, which reads magnetic field intensities from a few gauss to over 100,000 gauss. An electrostatic voltmeter will be on display with a demonstration to show its ability to measure static charges. This is possible because of the very low current drain. It will also measure RMS AC- or DC-voltages. An unusual type of wire-wound potentiometer will be shown which generates both sine wave and cosine wave output voltages when the shaft is rotated.

**The Rayoscope Company (Booth 11).** The Rayscope is a rather new and efficient micro-projector and its many uses will be demonstrated. Special emphasis will be placed on projection of living specimens for long periods of time on a screen at a distance so that groups of observers can see simultaneously. Customers are urged to bring their own specimen slides which they would like to project to large classes. You will thus be given an opportunity to make your own test as to effectiveness of micro-projection.

**Raytheon Manufacturing Company (Booths 112 and 113).** Raytheon is noted as the leading producer of microwave tubes, particularly magnetrons. A new type tube is exhibited, the grid magnetron, as well as recently introduced tubes of superior performance; a CW magnetron used in Raytheon's microwave television relay equipment, and a magnetron specifically designed for microwave cooking and heating of foods. Transistors, until recently a laboratory creation, were first put into mass production in Raytheon factories. These and other germanium products are featured, together with present and anticipated applications. Raytheon transformer engineers have developed various types of special purpose transformers. Those of particular interest are shown; these are recently introduced toroidal coils molded in plastic, and ferrite toroid pulse transformers. Also shown are new techniques in hermetic sealing of transformers. A servo amplifier using the new toroids and transistors is displayed. Of interest to computer people is the magnetic shift register, a data storage device with various applications. Technical papers and information are available. The exhibit is attended by members of Raytheon's scientific and engineering staff.

**W. B. Saunders Company (Booth 12).** The W. B. Saunders Company cordially invites you to visit our exhibit where you will find on display our publications in the fields of the biological sciences, chemistry, hygiene and health, and medicine. Especially featured will be the following new books: Krueger, *Microbiology*; Glass and Hamrun, *Anatomy and Physiology Laboratory Manual*; Luder, Vernon, and Saffanti, *General Chemistry*; Routh, *20th Century Chemistry*; and Braun, *Bacterial Genetics*. You will be interested also in the following new editions: Todd, Sanford, and Wells, *Clinical Diagnosis*; American Pocket Medical Dictionary; Frohisher, *Fundamentals of Bacteriology*. On display also will be our complete list of titles in the science field. Saunders' representatives present are Tyler Buchenau, James P. Hughes, and David Miller.

**The Science Library (Booths 224, 225, and 226).** The Science Library is administered by the AAAS as an additional service to publishers of books, both exhibitors and nonexhibitors. It has become an integral part of each year's Annual Exposition of Science and Industry. In the Science Library, books of all publishers participating are grouped by fields of science—a convenience both to

the visitor who is restricting his inspection of books to a single category, and to the one who wishes to browse. Among the publishers represented in the Science Library are:

**AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE**

ACADEMIC PRESS, INC.  
ADDISON-WESLEY PRESS, INC.  
AMERICAN BOOK COMPANY  
ANNUAL REVIEWS, INC.  
APPLETON-CENTURY-CROFTS, INC.  
AUTHOR'S PRESS  
BASIC BOOKS PUBLISHING CO., INC.  
BURGESS PUBLISHING COMPANY  
CAMBRIDGE UNIVERSITY PRESS  
COLUMBIA UNIVERSITY PRESS  
THOMAS Y. CROWELL COMPANY  
E. P. DUTTON & Co., INC.  
ELSEVIER PRESS, INC.  
EMERSON BOOKS, INC.  
EXPOSITION PRESS INC.  
FOLKWAYS RECORDS & SERVICE CORP.  
HARVARD UNIVERSITY PRESS  
D. C. HEATH AND COMPANY  
HENRY HOLT AND COMPANY  
IOWA STATE COLLEGE PRESS  
LEA & FEBIGER  
THE MACMILLAN COMPANY  
MCGRAW-HILL BOOK COMPANY  
PRENTICE-HALL, INC.  
REINHOLD PUBLISHING CORPORATION  
RINEHART & COMPANY, INC.  
SCOTT, FORESMAN AND COMPANY  
SILVER BURDETT COMPANY  
UNIVERSITY OF CALIFORNIA PRESS  
UNIVERSITY OF FLORIDA PRESS  
UNIVERSITY OF MINNESOTA PRESS  
UNIVERSITY OF NEW MEXICO PRESS  
UNIVERSITY OF PENNSYLVANIA PRESS  
UNIVERSITY OF PITTSBURGH PRESS  
YALE UNIVERSITY PRESS

**Special Libraries Association, Boston Chapter (Booth 227).** The Boston Chapter of the Special Libraries Association will exhibit materials to show what a special library is and what it does. The Science-Technology Division of the Chapter will have a particular part in the exhibit, and will show how such libraries can assist scientists and other research personnel.

**Arthur H. Thomas Company (Booth 228).** Arthur H. Thomas Company will feature their new paper electrophoresis apparatus for serum protein separation; a new type Van Slyke manometric apparatus will be demonstrated; and will also show a novel design of volumetric respirometer as suggested by Sholander and co-workers. We will also have on display an improved apparatus for tissue mincing and homogenizing in small quantities, and will have in operation the latest method of electrical re-

cording using a simplified electronic power source and electro-sensitive paper for use in kymographs. Various items of polyethylene laboratory ware, and other new miscellaneous apparatus will also be on display.

**Tracerlab, Inc. (Booth 213).** Tracerlab will exhibit a complete line of nuclear instruments, including a new scintillation detector, scintillation sample changer, and a wide range of laboratory accessories. Also on display will be several new scalers, including the superscaler, which features plug-in units such as the Plug-In Pulse Amplifier, which make it the most versatile scaler in production today.

**United Scientific Co. (Booth 133).** The United Scientific Company will have on display a representative selection of Unitron microscopes and astronomical telescopes. Members of the AAAS will have a first-hand opportunity to examine and test these instruments and verify their outstanding quality, performance, and value. Of particular interest are the new Unitron phase microscopes, available in four models and four contrasts. These instruments are of revolutionary design and are priced so low that even the student laboratory can afford to use the powerful methods of phase microscopy. A student model magnifying 30-600X, which may also be used for ordinary bright field microscopy, is available for as little as \$99. A research model magnifying 50-1500X, which permits continuous transition from bright field to phase contrast, sells for \$265. Another new instrument which will be shown is the Unitron universal camera microscope and metallograph. This versatile laboratory tool provides for observation, projection, photomicrography, and measurement of both transparent and opaque specimens under bright field, dark field, and polarized illumination. Its remarkably low price is only \$940, complete with accessories. Other Unitron microscopes on exhibit will include laboratory and medical, stereoscopic, metallurgical, and student models, as well as photomicrographic accessories. Literature will be available.

**Vectron, Inc. (Booth 114).**

**W. M. Welch Manufacturing Company (Booths 201 and 202).** The W. M. Welch Manufacturing Company will display laboratory equipment for physics, chemistry, biology, botany, and zoology laboratories; vacuum pumps, meters, balances, E/M apparatus, electronics teaching devices, triode, power supply, transmitter, receiver thyatron, film loops for teaching wave motion, atomic structure demonstrations; models (anatomical, zoological, botanical); charts and sets of charts for teaching physics, chemistry, biology, and physiology; the Densichron Densitometer, Dick-Stevens Hemoglobinometer and Colorimeter.



## News and Notes

### Report of the Committee on Battery Additives

THE Committee on Battery Additives of the National Academy of Sciences reported on Oct. 30 to Secretary of Commerce Sinclair Weeks that in its opinion there is no merit in the battery additive AD-X2 and that no further tests of it are necessary. The Committee completely upheld the competency of the tests conducted by the staff of the National Bureau of Standards, and states further that the quality of work of the Bureau in this field is better now than at any past time. The following scientists composed the ad hoc committee:

Zay Jeffries, Chairman, Vice President (retired), General Electric Company, Chemical Division;

Elmer K. Bolton, Director of Chemical Department (retired), E. I. du Pont de Nemours and Company;

William G. Cochran, Professor of Biostatistics, Johns Hopkins University;

J. P. Fugassi, Professor of Physical Chemistry, Carnegie Institute of Technology;

John G. Kirkwood, Professor of Chemistry, Yale University;

Victor K. LaMer, Professor of Chemistry, Columbia University;

Lewis G. Longworth, Member, Rockefeller Institute for Medical Research;

Joseph E. Mayer, Professor of Physical Chemistry, University of Chicago;

Fred E. Terman, Dean, School of Engineering, Stanford University;

Samuel S. Wilks, Professor of Mathematical Statistics, Princeton University.

A summary of the most significant portion of the report follows:

*Summary of finding on AD-X2.* We find no data obtained from any well-designed scientific experiment which is inconsistent with the hypothesis that AD-X2 behaves like a corresponding mixture of sodium and magnesium sulfates, and is substantially neutral in its effect upon a lead acid storage battery. These experiments included a total of over 400 cells, a substantial number of which were selected or approved for tests by Pioneers. Limited information on field performance was provided by an additional 300 cells.

*Conclusion on AD-X2.* We conclude that the relevant data now available to us regarding the effects of AD-X2 are adequate to support the position of the National Bureau of Standards that the material is without merit.

*Recommendation regarding further tests.* We were impressed with the fact that although this additive has been available for six years, no tests have come to our attention which have, under proper controlled conditions, shown advantages for AD-X2. The four main tests on which we felt we must rely for relevant evidence were all conducted either for Mr. Ritchie or in accordance with procedures which he thought should show the merits of AD-X2.

We recommend that no additional tests on the merit of AD-X2 be undertaken by this Committee or under its

supervision. We could not propose new tests which would do more than reinforce the very considerable reliability of the conclusion we have drawn from the information now available, and to make a substantial improvement even in this regard would require elaborate tests involving hundreds of cells and extending over a period of years.

*Finding on the competency of the National Bureau of Standards.* To assist in appraising the quality of the work of the Bureau of Standards in the field of lead acid storage battery testing, we obtained brief biographies of scientists and engineers in the Electrochemical Section and in the Statistical Engineering Laboratory. We also obtained biographies of some scientists and engineers in other sections of the Bureau because they have been called upon for assistance in battery testing. We explored the past work of the Bureau in the battery field and noted that many important contributions had been made over the years. We made a study of the Bureau's work in testing battery additives. We were apprised of the cooperative activities of the Bureau with other laboratories, both in the United States and in other countries. We visited the laboratories of the Electrochemical Section and found them well equipped. We noted the efficient manner in which the Statistical Engineering Laboratory cooperates with the Electrochemical Section, both in the design and in the interpretation of experiments. We have made a special study of the Bureau's work in connection with tests and researches on sodium and magnesium sulfates and on AD-X2.

These studies indicated to us that the Bureau staff was very competent but we examined carefully the suggestions of others that the Bureau was incompetent. These suggestions are mainly covered by seven "complaints" and the interpretation that the M.I.T. tests disprove the conclusions of the Bureau on AD-X2. We wish briefly to discuss these.

#### A. Complaints.

*Complaint 1.* The Bureau's tests prior to January 1952 were insufficient to support the conclusions regarding the merits of AD-X2.

*Answer.* We cannot say exactly how much testing is sufficient. The tests do appear to be meager. Dr. Randall's statements, however, regarding the composition of AD-X2 and the Bureau's long experience with sodium and magnesium sulfates would not have led it to expect AD-X2 to be an exception. Also, if the Bureau was looking for effects of great magnitude, extensive tests would not be required. As evidence has accumulated, the conclusions of the Bureau's earlier tests have been substantiated. In view of the skill and long experience of the Bureau organization, definitive results should be produced with a minimum of testing.

*Complaint 2.* The Bureau discriminated against AD-X2 by distributing or making possible the distribution of Circular 504.

*Answer.* If AD-X2 was no different from comparable mixtures of sodium and magnesium sulfates, there was no reason why it should have been excepted.

*Complaint 3.* In reporting the results of the Ordnance Corps field tests on Page 28 of Circular 504, the Bureau was not justified in considering the untreated new batteries as controls for the 100 old batteries.

*Answer.* The complaint is valid.

*Complaint 4.* The batteries used in the Bureau tests described in Circular 504 were in a mechanically unsound condition because of a very high degree of overcharging and, therefore, do not represent a fair test under the conditions prescribed in *Pioneers'* claim for AD-X2.

*Answer.* We have been informed that the charging was stopped as soon as the rate of gassing showed a rapid increase and, therefore, it appears that the batteries were not overcharged. When the Bureau gave treated and untreated batteries the enormous overcharge prescribed in the Randall Bench Test, no effect was observed which would support the contention that an overcharge would have invalidated the tests reported in Circular 504.

*Complaint 5.* The merits of AD-X2 cannot be shown in laboratory tests.

*Answer.* We believe that if the benefits were as claimed, laboratory tests would reveal them.

*Complaint 6.* The June tests were not conducted exactly in accordance with the wishes of the manufacturer and, therefore, are without value.

*Answer.* The criticisms of the tests do not relate to major items. It is our opinion that the changes made improved the design of the tests.

*Complaint 7.* Certain of the personnel of the National Bureau of Standards were not objective and approached the AD-X2 tests with biased minds.

*Answer.* We found no evidence of this but ample evidence of healthy objectivity. In so far as the contact between the Bureau personnel and "outsiders" in the field of lead acid batteries is concerned, we found the relationships to be essentially those which could be expected among people having confidence in one another, with the common objective of arriving more nearly at the truth.

#### B. The M.I.T. Report.

It has been said that there is a controversy between the Bureau of Standards and the Massachusetts Institute of Technology. This impression arose, not because there is a controversy of any importance, but because of the interpretation put on the M.I.T. report by a consultant of the Small Business Committee of the United States Senate and the publicity relating to this interpretation. This interpretation was that the "results" in the M.I.T. report "give complete support to the claims of the manufacturer" (of AD-X2). We have dealt with this interpretation earlier but here we wish only to consider the M.I.T. report with reference to any bearing it may have on the competency of the Bureau.

If certain of the "results" (and more particularly [a]), in the M.I.T. report are correct, then there is an inconsistency not only between the M.I.T. report and the Bureau's reports, but also between the M.I.T. report on the one hand and, on the other, the Dean report, the Dirks report and the U.S. Testing Company data.

We believe that we know the source of this inconsistency. The M.I.T. tests were not well designed for old batteries differing markedly in the characteristics of the cells. We believe it is possible to deduce from the data in the report that in the majority of the cell pairings it happened that the better cells were treated with AD-X2 and that these same cells, which were initially in better condition, were the ones which showed up to better advantage in the tests. In certain of the cell selections where pre-tests were made, the treated and untreated cells had somewhat the same characteristics and the results showed no ad-

vantage for AD-X2. Had all the cell pairings been selected in this way, we believe the results of Dr. Weber's tests would have been consistent with those of the Bureau of Standards.

By far the most important result in the report is (a) which reads as follows:

"(a) Among the cells in any chosen battery, all cells in such battery having been subjected to the same previous history, except for treatment with AD-X2, treated cells showed larger capacities than did untreated cells, both being subjected to the same conditions of discharge."

If our conclusion is correct that the cell pairings favored AD-X2, the validity of result (a) is in doubt. With reference to result (b) on sediment, in other tests no difference between treated and untreated cells was observed. There is no disagreement on result (c) regarding bubble size. Result (d) on plate appearance is not correlated with battery performance. Result (e) on loss of liquid would be influenced by cell selection. Result (f) on temperature change concerns differences of small magnitudes which do not uniformly favor the treated cells and which also may be influenced by the cell selection. Result (g) on hydrometer readings, besides not being correlated with battery performance, has not been observed by other testing groups. Result (h) is valid for very dilute electrolytes.

We are of the opinion, therefore, that the M.I.T. report casts no adverse reflections on the quality of the work of the Bureau of Standards on AD-X2.

*Conclusions regarding the work of the National Bureau of Standards.* We conclude from our studies and investigation that the quality of the work of the National Bureau of Standards in the field of lead acid storage battery testing is excellent. This statement is made without reservations.

Our opinion is that the quality of the work of the Bureau is better now than at any time in the past. This is partly because of the closer cooperation of the Bureau's Statistical Engineering Laboratory with the Electrochemical Section in the design and in the interpretation of battery tests.

*Editorial comment.*<sup>5</sup> In considering the conclusion of the famous battery affair, scientists should take account of a number of aspects. There is first the magnificent statement by Secretary Weeks "that [the above] scientific evaluation is an assurance to the public and a source of satisfaction to me and to the Bureau. I shall do all in my power to aid the Bureau in maintaining this high level of scientific service to the nation." Secretary Weeks has in fact learned a lot since the outbreak of the "Astin affair" about the nature of scientific evaluation and the proper relations to be maintained between scientific and administrative heads in branches of the government. It is encouraging to see that others, who apparently were not so able to modify their views, have left the Administration. In fact, if the outcome of the episode were restricted to a re-evaluation of the functions of the NBS and its relations to the head of the Department within which it operates, much good might yet come of the affair célèbre. But that is by no means all that has happened. The crucial outcome, like that in the approach to the transfer of Camp Detrick to



industrial management (see SCIENCE, Nov. 13, p. 584), is the effect upon the morale of the scientific staff. Administrators must unflinchingly endeavor to learn the primary axiom of scientific production: *Key scientists are unique and irreplaceable*. It follows that morale is more important than money or politics, and that he who destroys morale in a scientific laboratory of the government is an enemy of the people. It also follows that when charges of incompetence, or of subversion, are directed at scientists in government laboratories, whatever investigation is necessary should be conducted with the greatest of care not to injure morale. In the past this has very clearly not been done, and not alone in the present case. These facts indeed raise the question whether the nation would not profit by having all its scientific institutions collected into one department, under the leadership of a man who by training and experience knows the nature and problems of scientific enterprise, instead of being scattered as now in numerous departments and independent agencies, some of which are administered with insight while others exhibit a sad lack of it. Without endorsing the idea, we may profitably weigh the pros and cons.

(These comments by the editor are not to be taken as the official views of the AAAS.)

## Science News

A rare type of ancient spider dating back 250 million years to the Carboniferous Age was among the 45,353 specimens brought back by three American Museum of Natural History entomological expeditions to the western United States and Mexico, according to Mont A. Cazier, Chairman of the Museum's Department of Insects and Spiders. Nocturnal spiders, beetles, and geometrid moths were the main quarry, respectively, of the three expeditions, which went out to discover new species and to extend the range of the species already collected and described.

Willis J. Gertsch, Curator in the Department of Insects and Spiders, accompanied by his 17-year-old son John, traveled for two months in a red jeep and trailer along the California coastal ranges and back down along the Sierras to find out more about the spider fauna of the Southwest. Among the 10,000 insects, spiders, and miscellaneous vertebrates brought by Dr. Gertsch was a rare spider, discovered in Kings Canyon, Calif., that dates back to the Carboniferous Period. A member of the hypochilid family, the spider is an ancient type of which few representatives are remaining today. They have been discovered in China, Tasmania, southern Chile, and in the southern Appalachians in this country. Many nocturnal running spiders, the trapdoor spiders and their relatives the turret spiders, were collected by Dr. Gertsch, who also brought back some of the turrets and trapdoor nests of these spiders. According to Dr. Gertsch, California has a remarkable spider fauna, most of which have not yet been described.

Long horned beetles, tiger beetles, snout beetles,

butterflies, wasps, and scorpions were among the 30,000 insects and spiders collected by the expedition which went to central Mexico. This expedition, sponsored by David Rockefeller, was staffed by Dr. and Mrs. Charles Vaurie. Dr. Vaurie is a Research Associate in Ornithology and his wife is an Assistant in Entomology. Covering 10,000 miles in their two and one half months' trip, the two scientists gathered specimens in Guanajuato, Jalisco, Sinaloa, Aguas Calientes, Nayarit, and Colima. They traveled by carryall, equipped with a small tent, air mattresses, about 200 tins of canned food, and lanterns, nets, and cigar boxes for collecting.

The third expedition, led by Frederick Rindge, Associate Curator in the Department of Insects and Spiders, who was assisted by his wife, returned from the Rockies with 5353 insects and spiders of which there were 3770 butterflies and moths, 177 spiders, and 1406 miscellaneous insects. Dr. Rindge is particularly interested in the members of the moth family, Geometridae, more commonly known as inch worms. He and Mrs. Ridge traveled 5638 miles during their one-month trip. Much time was spent on the Snowy Range in Wyoming at a height of 11,000 feet in search of moths that frequent areas of high altitude.

The specimens collected on these expeditions will contribute to a study currently being undertaken by the Department of Insects and Spiders on the geographical distribution of the insect fauna of Mexico and Central America and its interrelation with that of the United States. This study is of interest not only to entomologists but also to students of public health and genetics.

The dearth of science teachers so frequently discussed in this country is not a unique situation, as one realizes in reading a recent statement in the October issue of *Discovery*, pp. 299-301. In Great Britain, as here, salaries are low, hours are long, and it is extremely difficult to attract university students to the teaching profession. There is a sharp contrast between the men working in the humanities and the men working in science.

"A school advertised for a Physics Master, only four replies were received, all from graduates with only pass degrees; at the same time the school advertised for a French Master, the result was 82 replies, seven from men with a first class degree. Prewar all the Science staff at this school had honor degrees, the last three science masters to join had pass degrees only. It is interesting that Scotland is taking the lead to remedy the situation. A committee has been appointed headed by Sir Edward Appleton to enquire into the supply of science and mathematic teachers, and even more important to suggest remedies."

It will bear watching to see what this committee is recommending, and how far these recommendations could be used in the United States.

Mine roofs can be "sewed" into place with half-inch wire rope cemented into deep holes bored in the



mine's roof, a Norwegian mine engineer has found. Similar in function to roof bolting, the technique involves drilling holes of 1.25 inches in diameter in the mine roof about 6 to 9 feet apart and 6 to 9 feet in length. Loops of half-inch wire rope are shoved into the holes. Then one-eighth-inch pipe is pushed into the hole to act as an air vent. A special plug is inserted in the opening of the hole and cement grout is forced into the hole under pressure. The grout spreads through fissures in the earth that the long hole has penetrated and, upon hardening, effectively "glues" the fissures back together.

"Success of this method is attributed to the fact that loose rock is cemented into one solid block which is suspended by the wire rope loops in the drill holes from solid rock overlying the loose rock," C. C. Austin, retired official of the Goodman Manufacturing Co., reports in the *Engineering and Mining Journal*.

As developed by Einar Troften, chief mine engineer at the Sulitjelma Gruber mine in Norway, the technique is called "roof sewing" because the loops are made of one continuous length of wire rope. Running from hole to hole, this wire rope dangles slightly below the mine roof and resembles loose stitches of thread in cloth.

## Scientists in the News

Theodore E. Boyd of Scarsdale, N. Y., has been appointed Assistant Director of Research for the National Foundation for Infantile Paralysis. Dr. Boyd has been a member of the Research Department of the Foundation since 1947.

The following new appointments have been made at Hahnemann Medical College and Hospital, Philadelphia:

Madison Baldwin Brown, formerly Executive Vice-President, Administrator, and Medical Director of Roosevelt Hospital in New York City, has been named Medical Director of Hahnemann Hospital.

In September C. George Tedeschi, who had been Assistant Professor of Pathology at Boston University, assumed his work as Professor and Head of the Division of Pathology. Dr. Tedeschi came to America in 1939 from Italy, where he had been Professor of Pathology at the University of Ferrara.

William H. Ramsey, an assistant surgeon for Pennsylvania and Bryn Mawr hospitals in Philadelphia, has been appointed Associate Professor of Surgery (Proctology).

A. H. Burr and C. O. Mackey of the College of Engineering at Cornell University have been appointed to endowed professorships. Both are in the Sibley School of Mechanical Engineering. Prof. Burr, Head of the Department of Machine Design, has been named Hiram Sibley Professor, and Prof. Mackey, Head of the Department of Heat-power Engineering, becomes John Edison Sweet Professor of Engineering. Prof. Burr is spending a sabbatical leave this year in Brazil,

where he is helping to reorganize engineering courses at the Institute of Aeronautics in São José dos Campos.

Charles M. Gruber of Jefferson Medical College, and Otto F. Kampmeier of the University of Illinois, have been appointed heads of the departments of Pharmacology and Anatomy, respectively, at the School of Medicine, College of Medical Evangelists, Loma Linda.

Jacob I. Hartstein, Chairman of the Education Department at Long Island University, has been named Dean of the Graduate School. For 15 years Dr. Hartstein has been associated with the university's education and psychology departments.

Last month Weikko A. Heiskanen of Ohio State University flew to Finland to receive an award from the Wihuri Foundation, the country's largest scientific foundation. Dr. Heiskanen was honored in recognition of his "high international reputation in geodesy and geophysics and his achievements in the Finnish cultural life."

H. Van Zile Hyde, Chief of the Division of International Health, Public Health Service, has been appointed by the President to serve as United States representative on the Executive Board of the World Health Organization.

Seymour Korkes, formerly an assistant professor of pharmacology at New York University, has become Associate Professor of Biochemistry at the Duke University School of Medicine.

Maurice E. Krahle, Associate Professor of Biological Chemistry, Washington University School of Medicine, St. Louis, has been appointed Professor of Physiology at the University of Chicago.

C. H. Long, formerly a member of the physics staff at Miami University, Oxford, Ohio, is now Associate Professor of Physics at Rose Polytechnic Institute, Terre Haute, Ind.

Conrad E. Ronneberg has returned to his duties as Professor of Chemistry and Chairman of the Department of Chemistry at Denison University after being away for a year on sabbatical and special leave.

The 1954 William H. Nichols Medal of the American Chemical Society's New York Section has been awarded to Charles Phelps Smyth, Professor of Chemistry at Princeton University. The medal is conferred annually to stimulate original research in chemistry. It will be formally presented to Dr. Smyth in March.

Daniel Leigh Weiss, formerly research assistant in pathology at Mount Sinai Hospital, New York City, has been appointed Director of Laboratories and Pathologist at the District of Columbia General Hospital, Washington. He has also been appointed Adjunct Professor of Pathology at Georgetown University Medical School and Clinical Adjunct Pro-

fessor of Pathology at George Washington University Medical School.

**Gordon R. Williams**, formerly an engineer with the firm of Knappen-Tippetts-Abbett-McCarthy, Consulting Engineers, has become an associate professor in the Department of Civil and Sanitary Engineering at the Massachusetts Institute of Technology.

The Office of International Relations, National Academy of Sciences—National Research Council, has provided the following information concerning the travel plans of scientific visitors to the United States:

**G. Asboe-Hansen**, Laboratory for Connective Tissue Research, University Institute of Medical Anatomy, University of Copenhagen, Denmark. Feb. 15–Mar. 30. Will attend Conference on Connective Tissues. c/o Josiah Macy, Jr. Foundation, New York City.

**A. Albu**, Engineer and Labour Member of Parliament; Hon. Joint Secretary of the Parliamentary and Scientific Committee. Due in autumn for a lecture tour under the auspices of British Information Services.

**Sir Edward Bullard**, Director of National Physical Laboratory, London. Arrives during November for a geophysical conference in Los Angeles and the Pacific Science Congress, Manila. c/o U.K. Scientific Mission, Washington.

**S. Chapman**, Professor of Geophysics, University of Alaska. Until Dec. 15 will be at 720 State Street, Ann Arbor, Mich.; until Mar. 1 will be at University of Alaska; and until May 15 will be at Dept. of Physics, New York University.

**K. G. Denbigh**, University of Cambridge, England. Specialist in thermodynamics and chemical kinetics. Sept. 12–Dec. 23 for visiting professorship at University of Minnesota.

**H. Groppe**, specialist in engineering and organization for the Inland Waterway Engineering Sect., Federal Ministry of Transportation, Bonn, Germany. Arrived Oct. 15 for 90 days. c/o Mr. Wilfred Brunner, U.S. Department of Labor (OILA).

**J. E. Hartshorn**, Industrial Editor of *The Economist*, London. Arrived Oct. 5 for 8-wk study of research in industry. c/o U.K. Scientific Mission, Washington.

**A. V. Hill**, Honorary Research Associate, University of London. Will attend Columbia University Bicentennial and AAAS meeting.

**H. A. Krebs**, Professor of Biochemistry, University of Sheffield, England. Feb. to Apr. Will visit Johns Hopkins, Chicago, and Wisconsin universities.

**N. Kurti**, Clarendon Laboratory, Oxford. Will attend International Low Temperature Conference in Houston, and visit laboratories in U.S. c/o U.K. Scientific Mission, Washington.

**W. Lane-Petter**, Medical Research Council, London. Nov. 25–Dec. 16. Will attend Animal Care Panel, Chicago. c/o U.K. Scientific Mission, Washington.

**E. J. Le Fevre**, Mechanical Engineering Research

Organization, London. Nov. 29–Dec. 23. Will attend A.S.M.E. meeting. c/o U.K. Scientific Mission, Washington.

**A. C. Locke**. Arrived Sept. 15 for 3-yr. stay as Executive Assistant to the Director of the U.K. Scientific Mission, Washington.

**K. A. G. Mendelssohn**, F.R.S., University Demonstrator, Clarendon Laboratory, Oxford. December through January. Will attend Conference on Low Temperatures, and will be at Stanford University and Berkeley, Calif.

**L. B. Pfeil**, F.R.S., Director, Mond Nickel Company, London. Nov. 10–Dec. 16. c/o Mr. T. H. Wickenden, International Nickel Co., Inc., 67 Wall St., New York 5.

**R. E. O. Williams**, Public Health Laboratory, England. Arrived Nov. 7 for a month. Will attend American Public Health Association meeting in New York. c/o U.K. Scientific Mission, Washington.

**H. V. Tuominen**, Chief Geologist, Suomen Malmi Oy (Finnish Ore Company), Helsinki. Is Assistant Professor of Geology for 1953–54 at Lehigh University.

**H. Nutzhorn**, industrial psychologist, Textile Plant, Nordhorn, Germany. Arrived Oct. 15 for 60 days. c/o Mr. Wilfred Brunner, U.S. Department of Labor (OILA).

**V. Schytt**, Chief Glaciologist, Norwegian, British, and Swedish Antarctic Expedition, 1949–52. Will spend year in The College of Liberal Arts, Northwestern University.

**J. A. L. Robertson**, Ministry of Supply. Will be Physical Metallurgical Liaison Officer, U.K. Scientific Mission, Washington.

## Education

The Educational Committee of the American Medical Writers' Association, under the chairmanship of Richard M. Hewitt of the Department of Publications, Mayo Clinic, has been instrumental in the establishment of courses in medical journalism at two universities in the Middle West. The University of Illinois School of Journalism has a pilot student testing a 4-year course that has been outlined, and the University of Missouri School of Journalism has announced its willingness to institute a similar program next year in cooperation with its newly enlarged medical school.

The American Medical Writers' Association has appealed to its members to assist the new educational project by making suggestions for interesting qualified high school students in the courses, and by making scholarship funds available.

The Kellogg Gull Lake Biological Station of Michigan State College will begin classes and research in 1954. The 32-acre estate that will serve as headquarters for the station was a gift of the Kellogg Foundation following World War II. This year an additional grant of \$45,000 was given to M.S.C. by the Founda-

tion to remodel the estate and to acquire certain basic equipment. H. J. Stafseth, head of the college's Division of Biological Science, has been named director of the station.

Courses will be offered for the first time next summer. These are expected to be especially appealing to elementary school teachers as well as to graduate and undergraduate biology students. The subjects covered will include nature study, botany, zoology, entomology, parasitology, bacteriology, fisheries, and wildlife. From 75 to 100 students can be accommodated during the summer. Those interested in the courses being offered next season should communicate with Dr. Walter F. Morofsky, Executive Secretary and Resident Director, The Kellogg Gull Lake Biological Station, Department of Entomology, Michigan State College, East Lansing.

Research activity of New York University's College of Engineering increased 14 per cent during the last year and passed the \$2,000,000 mark. The annual expenditure for sponsored research was \$2,017,000, as compared with \$1,758,000 the previous year. In 10 years the rate of operation has increased twentyfold. The staff, totaling 405, is five times as large as during the first year of operation.

States with the highest number of doctors per capita have the largest number of young men and women who want to enter medical school, according to statistics compiled by the Association of American Medical Colleges and reported in the October issue of *The Journal of Medical Education*. It is suggested that the common economic, educational, and cultural factors which attract doctors also stimulate students to become doctors.

The District of Columbia had the largest number of applicants for admission to medical schools this fall—19 per 100,000 population, while the doctor ratio is 31 per 10,000 population. New York ranked second with 18 applicants per 100,000 population and a doctor ratio of 20 per 10,000.

The study shows that chances of gaining admission to medical schools are greater for students living in states having state-supported schools. Ten states have no medical schools at all and four have only private schools. All private and some state medical schools accept some out-of-state applicants, but generally students from states not supporting medical education are not accepted in as great a proportion.

## Grants and Fellowships

Argonne National Laboratory has announced that applications for temporary research appointments in biology, chemistry, engineering, medicine, metallurgy, and physics are being accepted. The Laboratory reserves positions each year for faculty members on leave, postdoctoral investigators, and graduate students wishing to use its unique research facilities.

Appointments will ordinarily be made for a period of approximately one year, although applications for the summer, or for other periods less than a year, will

be considered in cases where useful results can be anticipated in the shorter time. Each applicant must be endorsed by his own academic institution. Further information and applications may be obtained by communicating with J. C. Boyce, Associate Laboratory Director, Argonne National Laboratory, P.O. Box 299, Lemont, Ill.

The Harvard School of Public Health has received a fellowship grant for \$3000 from Swift & Company to be used to assist in research on the metabolism of cholesterol in the cebus monkey, now being conducted in the school's Department of Nutrition by George V. Mann, Assistant Professor of Nutrition. Recently Dr. Mann has succeeded in producing for the first time a type of hardening of the arteries in the cebus monkey. This is of considerable interest because it is a step toward a better understanding of arteriosclerosis.

The Institute of Industrial Health of the University of Cincinnati will accept applications for a limited number of fellowships offered to qualified candidates who wish to pursue a graduate course of instruction in preparation for the practice of industrial medicine. Any registered physician, who is a graduate of a Class A medical school and who has completed satisfactorily at least 2 years of training in a hospital accredited by the American Medical Association, may apply for a fellowship in the Institute of Industrial Health. (Service in the Armed Forces or private practice may be substituted for one year of training.)

The course of instruction consists of a 2-year period of intensive training in industrial medicine, followed by one year of practical experience under adequate supervision in industry. Candidates who complete the course of study satisfactorily will be awarded the degree of Doctor of Industrial Medicine.

During the first 2 years, the stipends for the fellowships vary, in accordance with the marital status of the individual, from \$2100 to \$2700 in the first year and from \$2400 to \$3000 in the second year. In the third year the candidate will be compensated for his service by the industry in which he is completing his training. A one-year course, without stipend, is also offered to qualified applicants. Requests for additional information should be addressed to the Institute of Industrial Health, College of Medicine, Eden and Bethesda, Cincinnati 19, Ohio.

The Lalor Foundation, through a grant to the Marine Biological Laboratory, Woods Hole, Mass., is offering a limited number of postdoctoral fellowships in the fields of biochemistry, biophysics, and physiology, designed primarily for young scientists desiring to work not less than two consecutive months during the summer on investigations for which the opportunities provided by the Marine Biological Laboratory are particularly appropriate. The stipend is intended to cover laboratory fees, travel, and living expenses at Woods Hole. Completed applications should be received by Jan. 31. Blanks and further information may be secured from the Director, Marine Biological Laboratory, Woods Hole, Mass.

The Mount Desert Island Biological Laboratory, Salisbury Cove, Me., has received a grant of \$1000 from The Ciba Pharmaceutical Products, Inc. This sum is being made available for general support of the summer program, which features basic research in the fields of renal physiology and electrolytic balance, and of tissue culture.

The Muscular Dystrophy Associations of America, Inc. has awarded the following grants-in-aid:

Massachusetts Institute of Technology. M. Lubin. The relation between surface activity and the contractile force of muscle, 1 yr., \$5832.

University of California Medical Center. W. H. Bland. Studies in neuromuscular diseases, 1 yr., \$12,561.48.

The Pennsylvania Academy of Sciences has awarded the 1953 AAAS Research Grant jointly to A. W. Shively of Franklin and Marshall College for his project on abnormal plant growth, and to Robert M. Wotton of the University of Pittsburgh for his research on the nature of intracellular fat metabolism.

The Standard Oil Company of Indiana has established a research fellowship at Iowa State College for basic research on the physiological action of herbicides to be carried out under the direction of W. E. Loomis of the Department of Botany. C. M. Switzer of the Ontario Agricultural College and the University of Toronto has been appointed to the fellowship for the year 1953-54.

The Department of Biological Sciences at Stanford University has announced the establishment of a limited number of Eli Lilly Fellowships in Biology. These will be awarded to students at the predoctoral level at stipends ranging from \$1000 to \$2000. Inquiries should be addressed to Dr. V. C. Twitty, Chairman of the department.

The Union Carbide and Carbon Corporation has established a senior-year technical scholarship program at 41 engineering colleges and universities. The scholarships, individually sponsored by various divisions of the corporation, will cover the full tuition for a student's senior year, and \$200 for books and fees. The program, which includes one or more senior-year scholarships at each of the participating universities, went into effect this fall. The selection of scholarship recipients will be made by the universities themselves in accordance with their normal procedures. This will include consideration of the student's past performance and his potential for engineering and scientific study, as well as his potential for successful employment in industry.

## In the Laboratories

The Department of Physics at Tennessee Agricultural and Industrial State University has announced that the facilities of its infrared spectroscopy laboratory are available to the research laboratories of industrial concerns and universities in the southeastern section of the country. For samples furnished, the laboratory

will supply spectrograms and analyses of spectra embracing the spectral region 2 to 25 microns.

Heyden Chemical Company and American Cyanamid Company have signed an agreement for the sale by Heyden to Cyanamid of Heyden's Antibiotic Division, including the plant located at Princeton, N.J., and Heyden's patent rights and processes relating to the manufacture of antibiotics. The acquisition will increase Cyanamid's facilities in the pharmaceutical field, providing for the production of penicillin, streptomycin, and neomycin. The two latter products have not heretofore been manufactured or sold by American Cyanamid.

The Monsanto Chemical Company plans to have completed a new application research and development center in Springfield, Mass., by late 1954. The additional 44,000 square feet of floor space is expected to provide working facilities for approximately 125 chemists, engineers, and other technically trained personnel who will provide customer service for product and market development in the field of plastics.

In order to facilitate the exchange of new scientific information, Southwest Research Institute plans to publish a monthly technical calendar for free distribution to 25,000 scientists and engineers in the Southwest region. Charles E. Balleisen, former supervisor of the institute's engineering mechanics laboratory, has been appointed editor of the pamphlet.

## Meetings and Elections

The American Pharmaceutical Association has elected the following officers for 1953-54: pres., F. Royce Franzoni, Washington, D.C.; 1st v. pres., John A. MacCartney, Detroit, Mich.; 2nd v. pres., Joseph B. Sprowls, Philadelphia, Pa.; sec., Robert P. Fischelis, Washington, D.C.; treas., Hugo H. Schaefer, Brooklyn, N.Y.

Principal officers for 1953-54 of the American Society for Horticultural Science are: pres., F. P. Cullinan, Plant Industry Station, Beltsville, Md.; v. pres., E. S. Haber, Iowa State College; sec.-treas., F. S. Howlett, The Ohio State University. Representatives to the AAAS Council are H. B. Tukey, Michigan State College, and S. L. Emsweller, Plant Industry Station, Beltsville, Md.

The American Society of Limnology and Oceanography elected the following officers for 1953-54: pres., W. M. Cameron, University of British Columbia; v. pres., M. B. Schaeffer, Scripps Institution of Oceanography; sec.-treas., G. L. Pickard, University of British Columbia; members-at-large, E. C. LaFond, U.S. Navy Electronics Laboratory, and K. O. Emery, University of Southern California.

New officers of the American Society of Parasitologists are: pres. elect, Clay G. Huff, Naval Medical Research Institute, Bethesda, Md.; v. pres., Donald B. McMullen, Army Medical Graduate Division, Wash-



ington, D.C.; sec., A. C. Walton, Knox College. E. R. Becker of Iowa State College is president for 1954, and R. M. Stabler of Colorado College is treasurer.

A new chemical society, the *Chemische Gesellschaft in der Deutschen Demokratischen Republik*, has been founded in the Russian Zone of Germany. Prof. Dr. E. Thilo is president, and Dipl.-Ing. Kaiser is secretary. The Board members are as follows: Prof. Dr. H. Bertsch, Berlin; Prof. Dr. H. Franek, Berlin; Dr. Heyder, Bitterfeld; Dr. W. Schirmer, Leuna; Prof. Dr. A. Simon, Dresden; Prof. Dr. W. Treibs, Leipzig.

In recognition of the need for an organization to disseminate knowledge on high vacuum technology, stimulate exchange of ideas, and encourage research on new processes and equipment, the **Committee on Vacuum Techniques, Inc. (CVT)** has been established. This committee is a non-profit Massachusetts corporation which embraces membership from industry employing vacuum processes, universities engaged in high vacuum research, and manufacturers of vacuum equipment and components.

At a meeting held in New York City in June, some 60 representatives of industry, the universities, and equipment manufacturers discussed the nature of an organization which would best serve their needs. Dr. Henry Barton of the American Institute of Physics described various problems associated with the formation of a technical society. He suggested that the group should be kept on an informal basis and concentrate on service to the vacuum field. A strong opinion was advanced that one of the most useful functions of such an organization would be the standardization of nomenclature, testing techniques, and equipment performance ratings. Considerable confusion has resulted in the understanding of such fundamentals, since high vacuum is employed by a broad variety of fields such as electronics, food, metallurgy, coating, distillation, pressure vessel testing, optics, and nucleonics.

The following chairmen of standing committees have been elected: Joseph B. Merrill of high Vacuum Equipment Corporation, Permanent Organization Committee; Harry Bliven of Vacuum Electronic Equipment Corp., Finance and Budget Committee; Everett M. Brown of Consolidated Vacuum Corp., Arrangements Committee; Rudy A. Koehler of General Electric Co., Program Committee; John H. Durant of National Research Corp., Publicity and Publications Committee; Benjamin B. Dayton of Consolidated Vacuum Corp., Standards Committee; Frederick McNally of Jarrell-Ash Co., Education Committee.

The new committee plans to sponsor a High Vacuum Symposium in June, 1954, at Asbury Park, N.J. Programming plans are well underway. The Committee on Vacuum Techniques, Box 1282, Boston 9, Massachusetts, is soliciting membership applications from individuals and companies involved in high vacuum technology.

The 2nd Conference on Scientific Editorial Problems will be held Dec. 27 during the annual meeting of the AAAS. Leading editors, publishers, and scientists will participate in the conference and all interested persons are invited to attend.

Marian Fineman, Chief, Editorial Branch, Dugway Proving Ground, is Chairman of the meeting. Speakers will include: W. Albert Noyes, Jr. (Senior Scientific Advisor to the Chief Chemical Officer; Editor, *Journal of the American Chemical Society*), "Probable Trends in Scientific Publications as Viewed from the Editor's Office"; Milton O. Lee (Managing Editor, *American Journal of Physiology*), "Problems in Financial Management of Scientific Journals"; George S. Tulloch (Editor, *Bulletin of The Brooklyn Entomological Society*), "Problems of the Editor of a Small Journal"; Ruth C. Christman (Acting Executive Editor, *THE SCIENTIFIC MONTHLY* and *SCIENCE*, and Associate Editor, Interscience Publishers), "Illustrations for Scientific Publications"; Richard M. Hewitt (Section of Publications, The Mayo Clinic), "Exposition as Applied to Medicine: Some of the Difficulties"; and Joseph D. Elder (Science Editor, The Harvard University Press), "Jargon, Good and Bad."

The Conference on Scientific Editorial Problems was organized in 1952 "To bring before the AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE some of the important problems that confront those who prepare scientific manuscripts, who are concerned with the preparation of technical reports, or who edit and produce scientific publications."

The H. H. Wills Physical Laboratory of the University of Bristol, England, in cooperation with the International Union of Pure and Applied Physics (particularly its Commission for the Physics of the Solid State) and with The Institute of Physics, is organizing a conference on **Defects in Crystalline Solids** to be held from July 13-17, 1954, in Bristol. While not excluding other subjects in the field, the organizers propose to give particular attention to defects such as dissolved atoms, vacancies and F-centres, to microwave resonance methods of investigating their properties, and to the way in which they react with dislocations. Thus dislocations will be discussed in their chemical aspects, as influencing diffusion and precipitation in the solid state, rather than in relation to plastic flow.

It is hoped that a number of authors from overseas will personally present their papers, and with this in mind the conference has been arranged to follow immediately after the General Assembly of the International Union of Pure and Applied Physics. Board and lodging will be provided in Wills Hall, a student hall of residence, on special terms, or at hotels. The conference is open to any scientist interested in this field, subject to the limitations of seating accommodation.

Further particulars may be obtained from the Secretary, H. H. Wills Physical Laboratory, Royal Fort, Bristol 8, or from the Secretary, The Institute of Physics, 47, Belgrave Square, London S.W.1. Those



wishing to attend the conference are asked to apply to the former, marking the envelope "1954 Conference," and stating whether they wish to be accommodated at Wills Hall or at a hotel and for what nights accommodation is required.

**Glutathione** was the subject of a 2-day symposium sponsored jointly by the National Science Foundation and the Office of Naval Research and administered by Columbia University. About 50 leading biochemists from the United States and foreign countries exchanged views on the role which glutathione plays in enzyme actions, growth, and the creation of body energy.

Five sessions were scheduled to discuss the organic chemistry of sulfhydryl compounds and glutathione; biosynthesis of glutathione and its role in peptide synthesis; methods for determination of glutathione; glutathione as a coenzyme; and the relation of glutathione to metabolism and disease. The proceedings of the symposium will be published in monograph form.

The symposium was directed by the following committee: Sidney Colowick, Johns Hopkins University; Arnold Lazarow, Western Reserve University; Ephraim Racker, Yale University; David Schwarz, Schwarz Laboratories, Mount Vernon, N. Y.; Earl R. Stadtman, National Institutes of Health; Heinrich Waelsch, Columbia University.

For the first time the **International Botanical Congress**, which will be held in Paris from July 2-14, 1954, will include a section exclusively devoted to phycology. French phycologists hope that many of their foreign colleagues will attend the meetings of this section. The preliminary program of these meetings will include: (1) comparative cytology of algae applied to classification; (2) biochemistry of algae applied to classification; (3) morphology and development of algae—particularly life-cycles and classification of chlorophyceae; (4) ecology, floristics and geographical distribution of algae (marine and fresh-water).

Phycologists who intend to submit communications to the Congress are requested to send to the secretaries of the Section of Phycology, *before Jan. 15, 1954*, a brief summary (written in English or in French) not to exceed 5000 letters or spaces for original communications for the program of the meetings, or 2000 letters or spaces for sundry communications.

Phycological excursions are planned:

A. Before the Congress (last week of June).

- 1) Marine: Along the Côte des Albères (Mediterranean Sea) at the Laboratoire de Biologie marine de l'Université de Paris in Banyuls-sur-Mer.
- 2) Fresh-water: In Auvergne at the Laboratoire Biologique de Besse en Chandesse de l'Université de Clermont-Ferrand.

B. After the Congress (from July 15 to July 21).

- 1) Marine: Along the Coast of Brittany on the Channel, at the Station Biologique de

Rosecoff de l'Université de Paris, including, if possible, an excursion for fresh-water algae in inner Brittany and a visit to a factory for production of iodine and alginate from algae.

- 2) Fresh-water: To subalpine lakes around Aix-les-Bains at the Laboratoire d'Hydrobiologie de l'Ecole Nationale des Eaux et Forêts du Lac du Bourget.

All matters concerning the Section of Phycology and the phycological excursions must be addressed to the secretaries of the Section: Prof. J. Feldmann, (marine algae), and Dr. P. Bourrelly (fresh-water algae), Institut Oceanographique, 195 rue St. Jacques, Paris 5.

The **3rd International Congress of Alpine Meteorology** is to be held at Davos-Platz, Switzerland, April 12-14, 1954. The following four subjects, in their relation to Alpine regions, are proposed for discussion on the program: synoptic meteorology; radiation; bioclimatology; and snow and ice. The meeting is being arranged by the two institutes in Davos, the Observatoire physico-météorologique de Davos (Dr. W. Mörikofer) and the Institut fédéral pour l'étude de la neige et des avalanches, Weissfluhjoch-Davos (Dr. M. de Quervain). These organizations wish to invite their colleagues and friends abroad to participate in the congress. Inquiries should be addressed to the observatory.

The 8th international congress of the **International Society for Cell Biology** (Cytology Congress) will be held in Leiden, Holland, Sept. 1-7, 1954. The officers of the Society are:

Pres.: E. Newton Harvey, Princeton University, Princeton, N. J., U.S.A.

Past pres.: J. Runnström, Wenner-Gren Institute, Stockholm, Sweden.

Vice presidents: E. Fauré-Fremiet, Laboratoire d'Embryogénie Comparée, Collège de France, Paris, France; Honor B. Fell, Strangeways Research Laboratory, Cambridge, England; G. C. Heringa, Histologisch Laboratorium, Universiteit van Amsterdam, Amsterdam, Netherlands.

Sec.-treas.: J. F. Danielli, Dept. of Zoology and Animal Biology, King's College, London.

Assist.-treas. in the U.S.A.: J. S. Nicholas, Dept. of Zoology, Yale University, New Haven, Conn.

P. J. Gaillard of the Laboratory for Experimental Histology, University of Leiden, is Chairman of the Dutch Committee. Correspondence should be addressed to the Secretary, Dr. W. H. K. Karstens, Botanical Laboratory, State University, Nonnensteig 3, Leiden.

Full members of the Society, and candidates for membership approved by the International Committee, are automatically entitled to attend the Congress and to introduce one guest. The International Committee has prepared a program of symposia including the following topics: induced enzyme synthesis; the formation of the intracellular matrix in plant and

animal tissues; (left open: to be filled by Dutch Committee); biochemistry of gene action; thyroid secretion; nuclear and chromosome structure; mitochondria; cell division and mitotic poisons; morphogenetic interactions between cells; virus synthesis; the active cell surface; submicroscopic structure of cytoplasm. Speakers will be announced by the Dutch Committee at a later date.

There will be no programs of general papers, but members and invited guests may contribute a paper to be read by title if accompanied by an abstract of 300-400 words. These abstracts will be published before the Congress, and should be sent as soon as possible to the Secretary of the Dutch Committee.

The 45th New England Intercollegiate Geological Conference met at Hartford, Conn., on Oct. 9-10, with 150 participants. Cosponsors were Trinity College and the Connecticut Geological and Natural History Survey, now celebrating its semicentennial.

Trips were led by John Rogers (triassic bedrock), Robert M. Gates (Western crystallines), R. F. Flint and R. V. Cushman (surficial geology of the Connecticut Valley), Janet M. Aitken (Eastern crystallines), and John Rodgers (New Haven area). The Geology Department of Dartmouth College (A. H. McNair, Chairman) will be host for the 47th meeting in October, 1954.

The Potato Association of America has elected the following officers for 1953-54: pres., J. W. Seannell, Ottawa, Canada; v. pres., Arthur Hawkins, Storrs, Conn.; sec., R. W. Hougas, Madison, Wis.; treas., John C. Campbell, New Brunswick, N.J.; past pres., J. H. Muncie, East Lansing, Mich.

## Miscellaneous

The Arctic Institute of North America, with the joint support of the Army, Navy, and Air Force, has prepared an *Arctic Bibliography*. It consists of three bound volumes, 4500 pages, which list or summarize more than 20,000 scientific papers and reports pertaining to the Arctic, and also official documents, books of exploration, and general magazine articles. Previously, the most recent complete bibliography of the Arctic was published in Vienna in 1878.

The bibliography is the work of a Directing Committee under the direction of Henry B. Collins of the Smithsonian Institution. The editor is Marie Tremaine. The three-volume set, up to date through 1949, is available at the Government Printing Office at a price of \$12.57. A fourth volume is in press and a fifth, now in preparation, will cover material through 1953.

Ancient bloodletting, called "The Art of Phlebotomy," was done with stone lancets, leeches, and by various other means. A permanent exhibit on bloodletting has been opened at the Smithsonian Institution in Washington.

A second printing has made available again Stanford Research Institute's report to the United States Atomic Energy Commission on the "Industrial Uses of Radioactive Fission Products." Copies may be obtained from SRI's Public Relations Office, Stanford, Calif., for \$1.50 each.

Submitted in Sept. 1951, but unavailable in the last few months, the publication reports the findings of a team of economists, market analysts, and engineers after studying more than 60 representative enterprises.

The Society of Protozoologists announces a new *Journal of Protozoology*, to begin publication in the spring of 1954. Papers concerned with original work on any aspect of the study of protozoa may now be submitted to the Editor, William Trager, The Rockefeller Institute for Medical Research, 66th St. and York Ave., New York 21, N.Y.

The journal will consist of 4 issues per year. The annual subscription will be \$9 for all except graduate students, for whom it will be \$6. Inquiries regarding subscriptions and membership in the Society of Protozoologists should be addressed to Norman D. Levine, Secretary, College of Veterinary Medicine, University of Illinois, Urbana, Illinois.

At a meeting of the American Pharmaceutical Association last summer Harry J. Loynd, the president of Parke, Davis and Co., stated that new drugs are being discovered at the rate of about two a year. Not very long ago the drug industry and medical profession felt much was being accomplished if one new drug was discovered every 25 years.

Volumes I and II of *The Palaeobotanist*, a journal published by the Birbal Sahni Institute of Palaeobotany, 53 University Rd., Lucknow, India, can be obtained from the Registrar of the Institute for 50 and 20 rupees, respectively.

A change has been made in the arrangements for representation of the United Kingdom's Ministry of Agriculture and Fisheries in Washington, D.C. The technological liaison that has hitherto been part of the work of the Agricultural Attaché's office will in future be carried out by a group in the United Kingdom Scientific Mission.

Research programs relating to materials or products that can be bought from private manufacturers have been dropped by the U.S. Bureau of Reclamation. The reorganization was ordered by Secretary of the Interior Douglas McKay, following the report of a survey group which spent two months studying the reclamation work.

The survey report criticized research involving paints and herbicides for which the Bureau laboratory developed composition specifications for manufacturers. Research concerning hydraulics and the physical and chemical characteristics of earth and rocks under varying conditions of load, hydraulic flow, and exposure will be continued.

## Technical Papers

### A *Physoderma* Disease of Barnyard Grass

M. J. Thirumalachar and Marvin D. Whitehead

Bangalore, India, and  
Department of Plant Physiology and Pathology,  
Texas A. & M. College, College Station

Leaves of barnyard grass *Echinochloa crusgalli* (L.) Beauv. collected near Patna, Bihar, India, showed the presence of numerous brownish linear spots 1-2.5 mm long. The spots were distinct and aggregated, imparting a pale yellow color to infected leaves. Infections were localized and not systemic.

*P. maydis* are pustulate and erupt, releasing free sporangia, whereas in the *Physoderma* species on barnyard grass the sori are nonerumpent, and resting sporangia are probably released on decay of the host tissue.

Cross-inoculation experiments were carried out at College Station, Texas, using resting sporangia from corn, which were available in abundance. Seed of *E. crusgalli*, *E. walteri* (Pursh) Hellar, and *E. colonum* (L.) Link from five localities, and corn as a check, were planted in 6-in. clay pots in which the sterile soil had been inoculated by mixing with finely ground infected corn-leaf sheaths containing numerous rest-

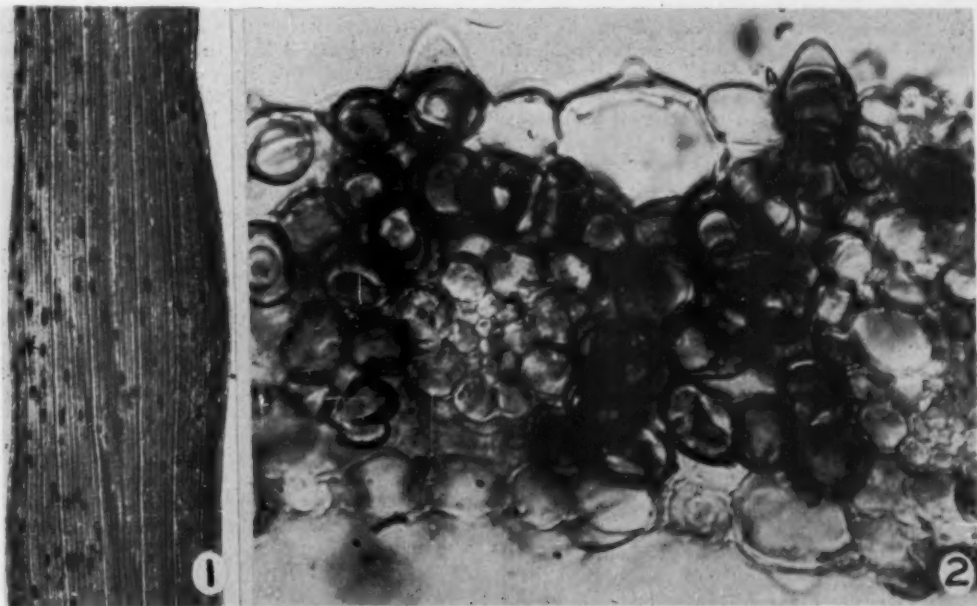


FIG. 1. Enlarged view of infection spots on leaves of *E. crusgalli* ( $\times 7$ ).

FIG. 2. Photomicrograph showing intracellular resting sporangia ( $\times 320$ ).

Microscopic examination of infected material stained with acid fuchsin in lactophenol revealed the presence of a *Physoderma* with tenuous rhizomycelium traversing the host cells, and numerous intracellular resting sporangia. Mature resting sporangia were yellowish-brown, ovate-elliptic, flattened on one side, and measured  $18-26 \times 10-16 \mu$ . The epispore is smooth and no haustorial processes or appendages have been noticed.

The *Physoderma* species on barnyard grass was collected in corn fields where the corn was infected with *P. maydis* Miy. Comparative morphological studies indicated that the two are separate species. Apart from differences in the sizes of resting sporangia, the sori of

ing sporangia. At the fifth leaf stage, the plants of both corn and barnyard grass were inoculated hypodermically into the growing point with a suspension of resting sporangia of *P. maydis*. Infection readings were made 30 days after hypodermic inoculation. The inoculated corn plants showed severe infections with *P. maydis*, but no abnormalities occurred on barnyard grass. Companion experiments were carried out in India, where the sporangia from barnyard grass were used to inoculate corn plants, and barnyard grass was used as a check. No infections were obtained on corn, whereas the barnyard grass check plants became heavily infected. The fact that no barnyard grass has been

noted to be infected by *Physoderma* in Texas, although corn becomes severely infected with *P. maydis*, indicates that barnyard grass is not a collateral host for *P. maydis* and that the *Physoderma* observed in India is a separate species. None of the graminicolous species of *Physoderma* given by Karling (1) are morphologically similar to the one under study. The fungus is presented as a new species with the name *P. echinochloae*.

*Physoderma echinochloae* sp. nov.<sup>1</sup> Rhizomycelium endobioticum, tenue, delicatulum, ramosum; sporangia perdurantia endobiotica, cellulas mesophylli fasciculos vasculares circumdantes implentia, luteo-brunnea, hemisphaerica, in latere uno applanata et operculum circumscissilem retegentia, 18–26 × 10–16 μ; episporium leve; germinatio non visa. Hab. in foliis *Echinochloae crusgalli*, Patna, Bihar, India.

Rhizomycelium endobiotic, tenuous; delicate, ramose. Resting sporangia endobiotic, filling the mesophyll cells surrounding vascular bundles, yellowish-brown, hemispherical, flattened on one side and revealing the circumscissile lid, 18–26 × 10–16 μ. Epispore smooth. Germination not observed. Habitat on leaves of *Echinochloa crusgalli* Beauv., Patna, Bihar, India, 12-7-1952, leg. M. J. Thirumalachar.

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<sup>1</sup> The authors are indebted to Edith K. Cash, Associate Mycologist, Division of Mycology and Disease Survey, U.S.D.A., for the preparation of the Latin diagnosis.

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## Separation of the Purines and Pyrimidines by Ionophoresis on Filter Paper

D. P. Burma<sup>1</sup>

Bose Research Institute, Calcutta, India

The technique of ionophoresis on filter paper is being extensively employed in separations of various types of mixtures, as reviewed by some authors (1–3). Nucleotides, the constituents of nucleic acid, have also been ionophoretically separated (4, 5). In this communication successful separations by ionophoresis on paper of the purine and pyrimidine bases, adenine, guanine, cytosine, thymine, and uracil, the building units of nucleic acids, are described.

The equipment used for this purpose was essentially the same as described by Durrum (6) with slight modifications and simplifications. A jar (used as a dome for candles) is inverted over a wooden base coated with paraffin. The opening at the top of the jar is ordinarily kept closed by a cork. One or more paper strips (each 1 cm wide and 57 cm long) of Whatman 1 filter paper are supported over a horizontal glass rod within the jar, the ends of the papers dipping into the buffer or any other conducting solution, contained in two different containers. The level

<sup>1</sup> My sincerest thanks are due to Dr. D. M. Bose for his kind interest and encouragement.

of the liquid in the two containers is made the same by temporarily connecting them through a siphon tube. Voltage is applied from the mains (220 v) through platinum electrodes. A milliammeter is connected in a series to record the current passing through the strips. After rinsing the paper strips with the conducting solution and adjusting the level of the liquid, the mixture to be separated is applied in state of solution from a micropipet at the apex of the supported strip (apex height about 28 cm) by temporarily opening the cork at the top. Usually 0.01 ml of the solution containing 5–15 μg of each of the purine and pyrimidine bases was found to be sufficient for the purpose. For advantages of detection, the constituents of the mixture usually were run individually side by side with the mixture on separate strips of paper. After passage of current for the requisite number of hours, the papers were taken out and held before the Chromatolite lamp (an ultraviolet lamp emitting 2537 Å radiation and specially designed for chromatographic purposes). Purines and pyrimidines appear as blue-black spots on a fluorescent background due to quenching of the fluorescence of paper in those regions (7).

Since purines and pyrimidines are mainly basic in character, buffers of acidic pH were tried as conducting medium for ionophoretic separations. After trials, citric acid-phosphate buffer of pH 2 was found to be suitable for the purpose. An average current of 0.15 ma flowed through each strip when 220 v were applied. Guanine, adenine, and cytosine were found to move toward the cathode whereas thymine and uracil remained practically stationary at the original starting line. Thus, separation of thymine and uracil was not possible under such conditions; fortunately, however, they do not occur in the same nucleic acid. They can be separated from each other using other conducting medium. Of the remaining three, guanine was slowest and cytosine the fastest, with adenine rather close behind cytosine. Though 2 hr were quite sufficient for separation of either guanine and adenine or guanine and cytosine, 6–8 hr were required for separation of adenine and cytosine. An 8-hr-run of a mixture of uracil (or thymine), guanine, adenine, and cytosine was found to be quite sufficient for their neat separations. The distances traveled by the components are found to vary slightly from experiment to experiment. Average distances are: uracil and thymine, 0 cm; guanine, 11–12 cm; adenine, 15–16 cm; and cytosine, 17–18 cm.

Thymine and uracil were separated from each other by using alkali solution as the conducting medium. The bases were applied as sodium salts by dissolving them in alkali. Using 0.1 N alkali, the two separate in about 8 hr, uracil being a bit ahead of thymine (uracil, 10–11 cm; thymine 9–10 cm). Runs for longer hours did not improve the results, but instead created disadvantages due to considerable electrolysis. Using stronger alkali (0.2 N), separation can be effected in a shorter period (4 hr), uracil being a bit ahead of thymine. (uracil, 4–5 cm; thymine, 3–4 cm). In this



case too, runs for longer periods failed to effect better separation.

Application of this technique in the identification of yeast nucleic acid has already been reported (8).

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## Erythrocyte Mosaicism in a Pair of Sheep Twins

Clyde Stormont, W. C. Weir, and L. L. Lane<sup>1</sup>

School of Veterinary Medicine and  
Department of Animal Husbandry,  
University of California, Davis

Almost a decade ago Owen (1) reported in SCIENCE his discovery of the phenomenon of compound blood types associated with multiple births in cattle. Subsequently, this condition became known as *erythrocyte mosaicism* (2). Individuals with red cell mosaics are believed to have hematopoietic tissues derived in part from their own embryonal cells and in part from embryonal cells of a co-twin, or co-triplets, etc. Fusion of blood vessels between developing embryos provides the channels for the intermingling of embryonal cells with subsequent establishment of these cells in the hematopoietic beds of each individual so joined. When the autograft produces cells of a serological type different from that of the cells produced by the homo-graft, erythrocyte mosaicism ensues.

TABLE 1

SHEEP TWINS N777 AND N778, AND THEIR PARENTS  
H454 AND 2955. REACTIONS OF UNTREATED  
CELLS (N777, N778) AND CELLS (N777/S3  
AND N778/S3) RECOVERED FOLLOWING  
DIFFERENTIAL HEMOLYSIS  
WITH S3 ANTIBODIES\*

Cells	Antibodies—Readings at 3 hr											
	R	O	S2	S3	S4	S5	S6	S7	S8	S10	S11	S12 S15
H454	4	0	4	4	4	4	0	4	4	0	4	3 4
2955	0	4	4	4	4	4	0	4	4	0	4	3 4
N777 }	0	4	3	1	4	4	0	1	1	0	4	2 4
N778 }	0	4	3	1	4	4	0	1	1	0	4	3 4
N777/S3 }	0	4	3	0	4	4	0	0	0	0	4	3 4
N778/S3 }	0	4	3	0	4	4	0	0	0	0	4	3 4

\* Readings 0, 1, 2, and others represent degrees of hemolysis ranging from 0 (no hemolysis) to 4 (complete hemolysis). Guinea pig complement was used in these tests.

<sup>1</sup> The authors wish to acknowledge the technical assistance rendered by Miss Yoshiko Suzuki, M. A. Burt, R. M. Stouffer, and C. B. Webster.

Although the detection of these mosaics is commonplace in dizygotic twins and higher zygotic multiples in cattle, there have been no reports of this phenomenon in species other than cattle. It is of interest, therefore, to report an example of this condition in a pair of sheep twins.

In another study (3) concerned with the development of blood-typing antibodies for use primarily in separating dizygotic from potential monozygotic ovine twins, we encountered a pair of twin lambs (N777 and N778) whose corpuscles reacted with certain antisera in a manner suggesting mosaicism. That is, only a fraction of their erythrocytes was hemolyzed by the action of antibodies found in three different ovine isoimmune antisera coded S3, S7, and S8 (Table 1), whereas those of their parents (H454 and 2955, Table 1) were completely hemolyzed. Unaffected erythrocytes (N777/S3 and N778/S3, Table 1) recovered following hemolysis with S3 antibodies were nonreactive in tests with S3, S7, and S8 but were hemolyzed by the other antisera (Table 1) which acted on the untreated cells. The ratio, approximately 40:60, of hemolyzed to nonhemolyzed corpuscles in tests with S3 was the same for each twin. There were, however, no antisera among our limited battery which would lyse only those corpuscles not lysed by S3 or S7 or S8. Although similar examples are encountered in cattle, in view of the nonreciprocal character of the evidence for mosaicism, it seemed advisable to strengthen these results by further tests. To this end absorptions were made on the S3 antiserum with the bloods of each of the twins to make certain that the hemolysis of their corpuscles with these antibodies was not nonspecific. Both bloods readily absorbed the antibodies in this serum. Although the male of this pair died a few weeks after these initial tests, the results of the differential hemolytic tests shown in Table 1 were repeatedly confirmed on samples of blood drawn from N778 at intervals of several months. There was no doubt as to the permanence of the mosaic. It was concluded that the twins N777 and N778 had exchanged hematopoietic transplants through communal chorionic vascular channels.

In view of the general impression that vascular anastomosis between ovine embryos occurs rarely (if at all) our results came somewhat as a surprise since we had tested only 26 pairs of twins. The idea that vascular anastomosis between sheep embryos must be very rare probably traces to the writings of Lillie (4). He apparently based his conclusion on the absence of any reports of ovine freemartins rather than on his own study of four pairs of fetal twins. Since the time of Lillie's paper, there have been at least two reports of ovine freemartins (5, 6). We have also located another report, Rotermund's doctoral dissertation (7), on the subject of choriovascular arrangements between ovine fetuses. Rotermund noted fusions of blood vessels in one pair of heterosexual ovine twin fetuses out of a total of 11 pairs studied, but he did not mention whether the female appeared to be a freemartin.



The ewe N778 was placed with rams in two successive breeding seasons and, if bred, never conceived. Although superficially she would have passed as a normal ewe, examination of her vagina indicated that she was very probably a freemartin. She was killed and examined by veterinarians on the staff of the School of Veterinary Medicine. Although the anatomical details of this examination are not given in this report, they left no doubt that N778 was a true freemartin.

Our data in conjunction with Lillie's and Roter-mund's would suggest an approximate frequency of placental anastomosis of 5% in sheep twins. Given about one birth in three a twin birth and a sex ratio of approximately one pair of heterosexual twins to every pair of like-sexed twins (8), this would lead to estimating the frequency of freemartins among ewes as about 0.8%. This estimate is undoubtedly too high. Nevertheless, while the frequency of freemartinism might be low enough to escape detection by breeders, particularly if it is generally somewhat cryptic, as in the case of N778, it might nevertheless be frequent enough to explain a significant portion of nonbreeders among ewes. We are convinced that freemartinism would have gone undetected in the case of N778 had it not been for the observation of erythrocyte mosaicism.

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## Photosynthesis as a Photoelectric Phenomenon

Leonard S. Levitt

Department of Chemistry,  
Stevens Institute of Technology, Hoboken, New Jersey

The purpose of this paper is to propose a new mechanism for the crucial step of quantum conversion in photosynthesis. Quite recently it has been established that the prosthetic group of pyruvic acid oxidase is 6,8-thioctic acid (which may be abbreviated

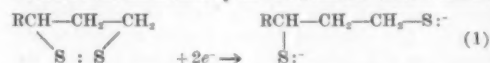
$\text{RCH}-\text{CH}_2-\text{CH}_2-\text{S}-\text{S}$ ), and that it is the disulfide (oxidized) form of this substance that is required in order that the oxidative decarboxylation of pyruvic acid take place (1, 2). It has been observed also that the presence of this compound is necessary in order that carbon dioxide be incorporated into the Krebs cycle to occur during photosynthesis (1, 2). Since

carbon dioxide is not absorbed into the cycle in the presence of light, it is thought that the disulfide group of pyruvic oxidase must be unavailable during the light reaction of photosynthesis.

It was proposed (1, 2) that the chlorophyll molecule absorbs a quantum of red light and transfers the electromagnetic energy to the already strained disulfide ring, resulting in its dissociation to a dithiyl radical  $\text{RCH}-\text{CH}_2-\text{CH}_2-\text{S}\cdot$  which was then presumed to

$\text{S}\cdot$   
extract two hydrogen atoms from some other molecule, possibly water (3), yielding the reduced dithiol  $\text{RCH}-\text{CH}_2-\text{CH}_2-\text{SH}$ .

$\text{SH}$   
To the author it appears rather unlikely for free radicals of any type to be produced within a living cell in aqueous solution (or suspension) where ions can be formed by means of a considerably smaller expenditure of energy. The transfer of electrons can occur much more rapidly and efficiently than the transfer of relatively cumbersome hydrogen atoms, and it is not to be supposed that nature has not yet been apprised of the fact. Thus, the direct capture of two electrons by the disulfide group of pyruvic oxidase would result immediately in the reduced dithiol state:

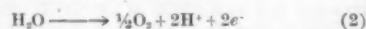


In such an event there would be no need to search further for "the precise species from which the sulfur-free radicals snatch the hydrogen" (2). All that is needed to complete the molecule, if, indeed, it is in need of completion, is two protons, which, in any aqueous system, are readily available.

There is some evidence (3) that the reduction product of the disulfide may sometimes be a thiol sulfenic acid of the type  $\text{RSSH}$ . In that case the  $\text{C}-\text{S}$  bond is broken instead of the  $\text{S}-\text{S}$  bond, and the immediate reduction product after the electron transfer would be  $\text{RCH}-\text{CH}_2-\text{CH}_2-\text{S}-\text{S}^-$ .

If the idea of electron transfer be accepted, the only question remaining would be "whence the two electrons?" A logical answer might be as follows: the chlorophyll molecule, on bombardment with photons of red light, absorbs one quantum, resulting in the activation of an electron to such a high-energy level that it is easily extracted by a mild oxidizing agent intimately associated with the chlorophyll molecule, namely, the disulfide group of pyruvic oxidase.

Probably the most fundamental reaction in photosynthesis is the oxidation of water:

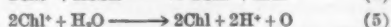
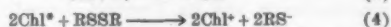
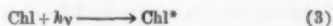


Now, instead of assuming (4) that chlorophyll in some way transfers its absorbed electromagnetic energy to a water molecule, which subsequently decomposes in the presence of a suitable oxidizing agent, let us assume again that chlorophyll molecules, on bombardment with photons, transfer electrons to the disulfide

and extract electrons from a water molecule. Therefore, while the oxidation of water is proceeding in the light, the incorporation of carbon dioxide into the tricarboxylic acid cycle is inhibited by the unavailability of the disulfide.

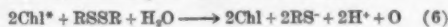
Whether or not chlorophyll exists intermediately as an ephemeral ionic species in this scheme depends only on the time lag between the initial loss of an electron by the chlorophyll molecule and the subsequent recapture of an electron from a water molecule. If the time lag is relatively great, then the chlorophyll will have been oxidized to a relatively long-lived positively charged ion. If the time lag is extremely small, as it would be if the new electron is acquired to replace the one removed from its normal energy level simultaneous with, or even before, the loss of the activated electron, then oxidative ionization of chlorophyll will not have taken place. In this connection, Rabinowitch (5), taking into account the absorption and fluorescence spectra and the photo-oxidation of chlorophyll in the presence of electron-accepting ions and molecules, states "Indications (are) that the activated chlorophyll molecules which fail to emit fluorescence are converted into a long-lived active form which may represent . . . an oxidized or reduced molecular species."

According to the present theory, then, the mechanism of photosynthesis may be summed up by the following equations:

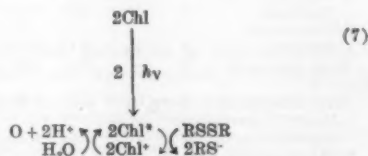


in which  $\text{Chl}^*$  and  $\text{Chl}^+$  represent chlorophyll with, respectively, an activated electron and a missing electron.<sup>1</sup> It will be noted that four quanta are required for the production of one oxygen molecule according to this scheme.

Equations 4 and 5 may be combined to indicate the possible simultaneity of these two reactions:



This may, perhaps, be best represented in typical biochemical notation for coupled reactions:



The entire process may thus be visualized as a flow of electrons actuated by light; or, essentially, as a photoelectric current flowing from water through the chlorophyll to the disulfide. The light-activated chloro-

phyll molecule, according to this view, appears to play the role of an oxidation-reduction enzyme (a dehydrogenase) and functions almost as what might be described as a conducting bridge between two half-cells in which reactions 1 and 2 are, respectively, taking place.

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### Tolerance of Certain Higher Plants to Chronic Exposure to Gamma Radiation from Cobalt-60<sup>1</sup>

Arnold H. Sparrow and Eric Christensen

Biology Department, Brookhaven National Laboratory, Upton, New York

Although the tolerance of a considerable number of species of higher plants to acute doses of ionizing radiation is known, only a few reports are available concerning tolerance of growing plants to chronic exposure to ionizing radiation. For this reason, a summary of preliminary information is presented here relating to the influence of chronic gamma radiation from cobalt-60 on a wide range of different species.

The  $\text{Co}^{60}$  sources used varied in strength from about 8 to 1800 curies, and the investigations were conducted under both greenhouse and field plot conditions. The procedure used for growing and irradiating the different species was that previously described by Sparrow and Singleton (1).

Under the conditions of our experiment, cytological, genetic, and physiological effects are known to occur (1, 2). However, the criterion used here to evaluate the effect of the radiation is the gross morphological appearance of the plant. In general, a mild effect means a slight decrease in height or vigor of the plant, and a severe effect means a definite, often dramatic, deviation from the normal or control plant in size, vigor, and in many cases general morphology (3, 4). Thus, in most cases, a "severe effect" means acute stunting or dwarfing from which the plant might or might not recover.

As shown in Table 1, there are considerable differences in the tolerance of different species to chronic irradiation. Certain plants (*Tradescantia paludosa* and *Lilium longiflorum*) show a mild effect at a dose rate of about 20 r/day, while others (broccoli and gladiolus) show no definite effects at dosages lower than 1400 and 4100 r/day, respectively. These data indicate a 200-fold difference in sensitivity between the least tolerant and most tolerant species so far investigated. A similar range is also shown by comparing the dose rate required to produce a severe effect

<sup>1</sup> Research carried on at Brookhaven National Laboratory under the auspices of the U.S. Atomic Energy Commission.

TABLE 1  
TOLERANCE OF VARIOUS PLANTS TO CHRONIC  
GAMMA IRRADIATION

Plant	Minimum exposure (weeks)	Effect at indicated dose rate* (r units per day)	
		Mild	Severe†
<i>Lilium longiflorum</i>	15	20(†)	30
<i>Tradescantia paludosa</i>	15	20	40
<i>Tradescantia ohimensis</i>	15	35	65
<i>Vicia faba</i>	15	60	90
<i>Impatiens</i> sp.	18	60	90
<i>Coleus blumei</i>	13	100	240
<i>Melilotus officinalis</i>	14	100	240
<i>Nicotiana rustica</i>	15	100	300
<i>Phytolacca americana</i>	15	100	350
<i>Datura stramonium</i>	7	110	360
<i>Gossypium hirsutum</i>	15	110	250
<i>Dahlia</i> (hybrid)	10	110	275
<i>Althea rosea</i>	12	120	250
<i>Luzula purpurea</i>	10	125	300
<i>Chrysanthemum</i> (hybrid)	18	140	250
<i>Canna generalis</i>	18	180	350
<i>Lactuca sativa</i>	7	180	600
<i>Chenopodium album</i>	15	250	450
<i>Antirrhinum majus</i>	18	250	400
<i>Lycopersicon esculentum</i>	15	250	400
<i>Xanthium</i> sp.	15	250	500
<i>Solanum tuberosum</i>	10	300	600
<i>Petunia hybrida</i>	10	300	700
<i>Celosia cristata</i>	18	300	750
<i>Lupinus albus</i>	12	400	—
<i>Kalanchoe daigremontiana</i>	12	400	800
<i>Allium cepa</i>	18	400	800
<i>Linum usitatissimum</i> ‡	10	600	1100
<i>Digitaria</i> (crabgrass)	12	1000	1800
<i>Brassica oleracea</i> (broccoli)	10	1400	2500
<i>Gladiolus</i> (hybrid)	8	4100	6000

\* Dose rate is in roentgens/24-hr day; however, the actual dosage/day averaged about 90% of the dose rate shown.

† This dose rate is not necessarily the lowest rate which will produce a severe effect.

‡ Data supplied by C. Konzak.

on these same species. An even greater range may reasonably be expected to appear when the investigation is extended to include a larger number of species.

There is little doubt that a large number of factors operate to determine the radiosensitivity of a given plant species. Changes in auxin (5) and ascorbic acid levels (2) in irradiated plants indicate that these substances may be involved in determining radiosensitivity. Our data also suggest that plants with large chromosomes (*Tradescantia*, *Lilium*, *Vicia*) have a higher sensitivity to chronic gamma irradiation than do most plants with small chromosomes.

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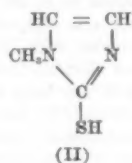
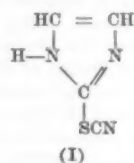
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## Antithyroid Activity of Thiocyanimidazoles<sup>1</sup>

Roger E. Koeppe and John L. Wood

Department of Biochemistry,  
University of Tennessee, Memphis

The 2-thiocyanimidazoles (I) are a new group of compounds recently prepared in our laboratory (1). Since these substances are structurally related to known antithyroid agents, e.g., 1-methyl-2-mercaptoimidazole (II), we have determined their inhibition of iodine uptake by rat thyroids. The method used



was essentially that of McGinty *et al.* (2). Adult white rats of comparable weight were injected intraperitoneally with 1-ml suspensions of the test compounds in 10% gum acacia. Approximately 1 hr later a tracer amount of I<sup>131</sup> was injected and, after a 4-hr interval, the thyroids were removed and assayed for total radioactivity. The results of 2 experiments are summarized in Table 1 and show the 2-thiocyanimidazoles to be thyroid inhibitors. 2-Thiocyanimidazole and its 1-methyl derivative, in the doses employed, caused an inhibition of iodine uptake comparable to that of 1-methyl-2-mercaptoimidazole

TABLE 1  
IODINE UPTAKE BY THYROIDS OF RATS GIVEN  
ANTITHYROID COMPOUNDS

Compound	No. rats	Dose mg/rat	% uptake of administered I <sup>131</sup>		% of controls
			Av.	Range	
Expt. 1					
Propylthiouracil	8	0.5	0.21	0.14- 0.27	6.8
2-Thiocyanimidazole	7	1	0.33	0.10- 0.60	10.6
2-Thiocyanimidazole	3	5	0.13	0.07- 0.19	4.2
None (control)	8	—	3.1	2.2 - 4.8	100
Expt. 2					
Propylthiouracil	6	0.5	0.9	0.58- 1.38	9.9
1-Methyl-2-mercaptoimidazole	6	1	0.51	0.30- 0.75	5.6
2-Thiocyanimidazole	4	1	0.54	0.38- 0.71	5.9
1-Methyl-2-thiocyanimidazole	6	1	0.52	0.38- 0.76	5.7
4(5)-Methyl-2-thiocyanimidazole	4	1	2.3	1.0 - 3.6	25.3
None (control)	6	—	9.1	5.9 -12.3	100

<sup>1</sup>These studies were supported by the Atomic Energy Commission under Contract AT-(40-1)-283, Title VII.

(Tapazol). 4(5)-Methyl-2-thiocyanimidazole was considerably less effective although exhibiting definite antithyroid activity.

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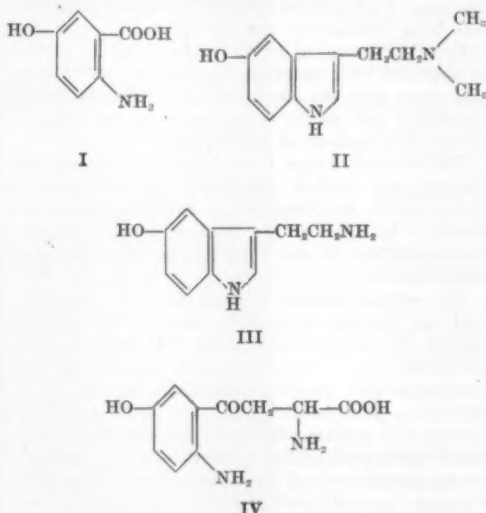
Manuscript received August 27, 1953.

## Synthesis of 5-Hydroxykynurenine<sup>1</sup>

Katashi Makino and Hitoshi Takahashi<sup>2</sup>

Department of Biological Chemistry,  
Kumamoto University Medical College,  
Kumamoto, Japan

Kotake (1) isolated 5-hydroxyanthranilic acid (I) from the urine of rabbits injected with anthranilic acid. This fact and the isolation of the 5-hydroxytryptophan metabolites bufotenine (2) (II) and serotonin (3) (III) from the natural sources suggested the synthesis of 5-hydroxykynurenine (IV).



The synthesis was performed as follows. 6-Nitro-3-methoxybenzoic acid was converted to its chloride by

<sup>1</sup> This work was aided by a grant from the Scientific Research Fund of the Ministry of Education of Japan.

<sup>2</sup> We wish to express our thanks to the Takeda Research Laboratory for making elementary analyses.

warming slightly with thionyl chloride. The resultant chloride (m.p. 34°) was condensed in dry chlorobenzene with the magnesium diethyl malonate and then decomposed to 6-nitro-3-methoxyacetophenone (m.p. 67° found: C 55.07, H 5.44, N 6.79; calc. for C<sub>9</sub>H<sub>9</sub>O<sub>4</sub>N: C 55.4, H 4.7, N 7.19%) by warming with hydrochloric acid and acetic acid. This was then converted to 6-nitro-3-methoxy- $\alpha$ -bromoacetophenone (m.p. 90° found: C 39.43, H 3.19, N 4.72; calc. for C<sub>9</sub>H<sub>8</sub>O<sub>4</sub>BrN: C 39.42, H 2.92, N 5.11%) and then condensed with ethyl acetaminomalonate in the presence of sodium in absolute alcohol. The resultant ethyl acetamino-6-nitro-3-methoxyphenacyl malonate (m.p. 145° found: C 53.21, H 5.69, N 6.8; calc. for C<sub>18</sub>H<sub>22</sub>O<sub>6</sub>N<sub>2</sub>: C 52.7, H 5.4, N 6.83%) was decomposed by refluxing with hydrochloric acid and acetic acid to 6-nitro-3-methoxyphenacyl glycine hydrochloride (m.p. 199°) which gave with ninhydrin a yellow color.

This nitro amino acid was dissolved in diluted sulfuric acid and hydrogenated in the presence of palladium black. The 5-methoxykynurenine sulfate thus obtained melted at 191° with decomposition and showed with ninhydrin a reddish purple color. On paper chromatogram developed with butanol-acetic acid-water system it separated in two spots with R<sub>f</sub> 0.32 and R<sub>f</sub> 0.36 which presumably correspond to D and L isomers.

5-Hydroxykynurenine sulfate was obtained by refluxing methoxykynurenine sulfate with hydrobromic acid in an atmosphere of carbon dioxide. 5-Hydroxykynurenine sulfate (found: C 37.28, H 4.26, N 8.35; calc. for C<sub>10</sub>H<sub>14</sub>O<sub>6</sub>N<sub>2</sub>S: C 37.27, H 4.38, N 8.69%) was a colorless small prismatic needle and began to darken at 225° and carbonized completely at 255°. Its aqueous solution showed a marked green fluorescence and gave with ninhydrin a purple color, with diazotized sulfanilic acid a purple color, with dimethylaminobenzaldehyde in hydrochloric acid an orange color, with ferric chloride a brown color and decolorized chameleon solution. Its R<sub>f</sub> value was 0.24 on the paper chromatogram developed with the supernatant of the mixture of acetic acid, butanol, and water in ratio 1 : 4 : 5. Its ultraviolet absorption spectra had a maximum at 405 m $\mu$  at pH 11.4 and a maximum at 378 m $\mu$  at pH 4.8.

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Manuscript received September 10, 1953.



## Book Reviews

**Psychosomatic Research.** Roy R. Grinker. New York: Norton, 1953. 208 pp. \$3.50.

"A critical analysis of existing theories and hypotheses of any field of science becomes necessary from time to time to counteract complacency and stimulate thinking." Dr. Grinker has attempted such a "challenging appraisal" of psychosomatic research based on a rough analogy from physical field theory. He begins with a review of psychosomatic concepts both historical and current. Many modern workers are considered. Their contributions are given due credit while their shortcomings are viewed from a "transactional" framework. Dunbar is seen making disease a stereotype and profile a statistic. Alexander's thinking appears as hampered by concepts such as the assumption that specific emotions have specific vegetative patterns. In general, the basic failure is the lack of an operational multidisciplinary longitudinal approach. The author feels that the two most needed methodological procedures are genetic (longitudinal and developmental) and transactional (prolonged simultaneous and multidisciplinary).

All this is justified by viewing psychosomatic research in terms of field theory analogy. Health and disease make up a continuum. The environment boundaries of the organism are not sharp. Growth is the process of development by which part functions of the organism specialize. This specialization begets increasing part function autonomy in dealing with stress until an overwhelming stress produces a return to a less differentiated mass reaction. Because of the crucial role of infant-mouth-breast-mother relationship (or transaction) in the process of differentiation and subsequent regression, orality is considered in some detail. At this point the book is at its best with some external reference to breathe life into the abstract. Several psychoanalytic concepts that are losing their value are discussed. In general, Dr. Grinker feels that psychology has accepted mouth function too literally. The book closes with chapters on "integration and field theory" and "anxiety and psychosomatic transaction." Transaction is seen as taking place between nodes in a field. Form becomes function as spatial observation becomes temporal. Causality is a fallacy for there exist only circular transactions.

To summarize this brief review of the book's content, one can say that the author points out some of the overgeneralizations that have grown up in psychosomatic research. He voices the widely felt need for multidisciplinary and longitudinal research and also restates some ideas about development and regression in an interesting way. Unfortunately the book is not clearly written, and it is often needlessly abstract. Perhaps worst of all is the use of the catchword "transactional" to support the thesis that all variables should be studied simultaneously. This is hardly what Cantrill had in mind. One must admit that a whole host of variables affect any process going on in the

organism. On the practical side, however, the experimenter who fails to narrow his observation down to the pertinent variable fails to obtain sufficient data on the important factors and ends up with an interesting narrative rather than a useful correlation. In other words, to determine a transaction, the process must be studied in both directions, but to claim that this must be done simultaneously and to neglect limiting the aspects of the transaction under study is most impractical.

ENOCH CALLAWAY III

Psychiatric Institute  
University Hospital, Baltimore, Maryland

**Biochemical Preparations**, Vol. 2. Eric G. Ball, Ed. New York: Wiley; London: Chapman & Hall, 1952. 109 pp. \$3.00.

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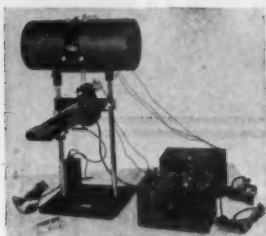
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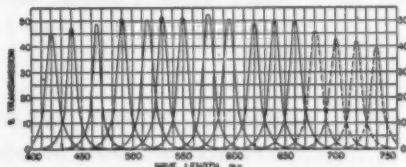
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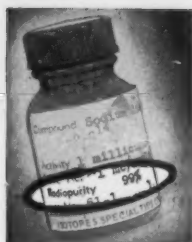
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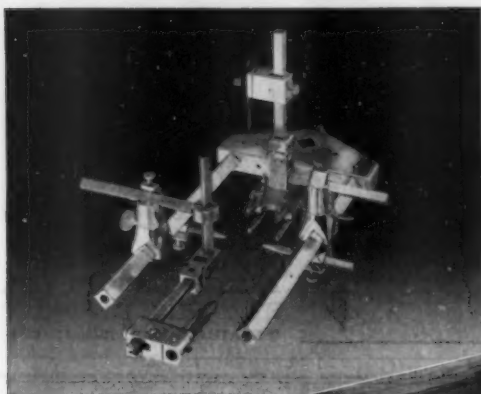
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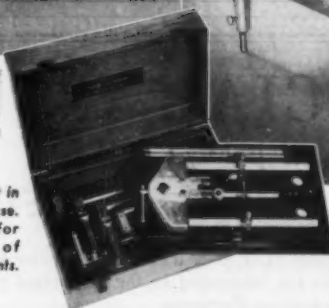
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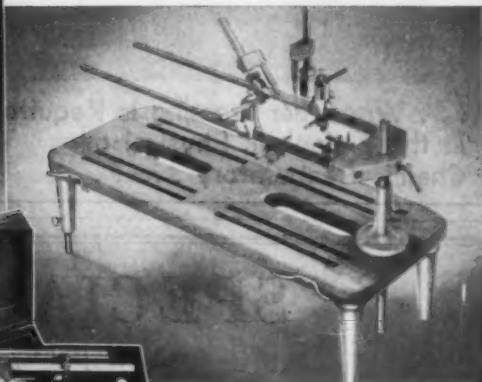


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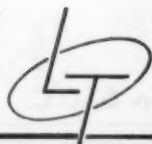


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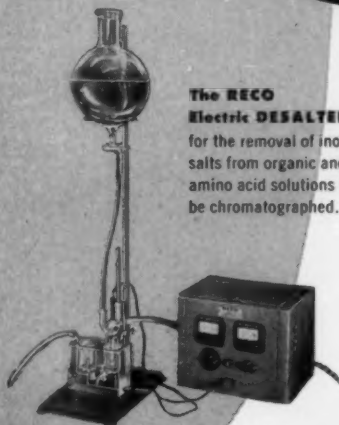
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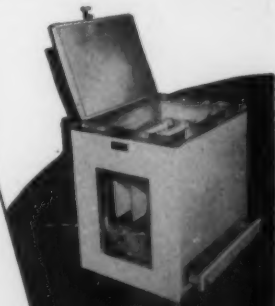
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